

THE BOTANICAL RESOURCES OF LA PURISIMA MISSION STATE HISTORIC PARK

SANTA BARBARA COUNTY, CALIFORNIA

Wayne R. Ferren, Jr.

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Dale M. Smith



THE HERBARIUM
Department of Biological Sciences
University of California, Santa Barbara
Publication Number 3
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Cover: La Purisima Mission - View to west overlooking southern portion of Purisima Canyon near its junction with the Lompoc Valley. Visible Mission structures include from left to right the cemetery, church, and various shops and quarters. Livestock corrals and mission grounds occur in the center of the photo. The Burton Mesa (background) supports numerous plant communities, including Northern Coastal Dune Scrub (lower mesa top, upper left-center), Central Coastal Scrub (mesa top, upper center), Chaparral (east-facing slope, upper right-center), Cismontane Introduced Grasses (mesa slope, upper left-center), and Southern Oak Woodland (east-facing slope, upper center). The riparian zone along Los Berros Creek supports Palustrine Forested and Scrub/Shrub Wetlands (lower portion of photo adjacent to corral). Oaks shading a picnic area occur adjacent to the riparian vegetation, followed by Central Coastal Scrub (foreground) on the west-facing slope of foothills to the Purisima Hills.

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This publication series is issued at irregular intervals from the Herbarium, Department of Biological Sciences, University of California, Santa Barbara, California 93106.

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Dedicated to the memory of Peter Van Coops
State Park Ranger 1972-1983
at La Purisima Mission State Historic Park 1981-1983

FOREWORD

This Publication Series of the Herbarium, Department of Biological Sciences, University of California, Santa Barbara, serves as a publication vehicle for UCSB students, faculty, staff, and other associated investigators. Manuscripts accepted for publication include primarily those with a floristic emphasis and those for which voucher specimens are deposited at UCSB. Papers published in this series might not be available otherwise to the general scientific and lay communities. This endeavor is consistent with the goals of the UCSB Herbarium, summarized as follows: 1) to maintain a botanical collections repository; 2) to provide educational programs; 3) to provide botanical services; 4) to function as a research facility within the Department of Biological Sciences.

UCSB Herbarium Publication Number 3, The Botanical Resources of La Purisima Mission State Historic Park, Santa Barbara County, California, is a product of floristic research conducted by faculty, staff, and students. Dr. Dale M. Smith served as principal investigator, Mr. Wayne R. Ferren, Jr. was the project manager, Ms. Holly C. Forbes compiled the plant catalogue, and Mr. Dar A. Roberts mapped the vegetation and investigated the geology and soils of the area. The team in general conducted the inventory and analysis.

Funding for this project was provided largely by the State of California, Department of Parks and Recreation, in the form of a grant to conduct an evaluation of the botanical resources at the Park. Funding for publication was provided by additional extramural sources.

Wayne R. Ferren, Jr.

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I N T R O D U C T I O N

Purpose - The objective of this investigation was to assess the botanical resources at La Purisima Mission State Historic Park. To achieve this objective we proposed the following: 1) to provide background information on the physical environment of the study area; 2) to classify, map, and describe the vegetation; 3) to interpret the successional history of the vegetation following various forms of disturbance; 4) to conduct an inventory of the vascular plants and provide an annotated catalogue of the taxa; 5) to identify the botanical resources (vegetation or species) of special concern; 6) to analyze the environmental sensitivity of the botanical resources and their habitats; and 7) to make recommendations for management procedures.

Methods - Background information on the physical environment of the region was obtained from a review of pertinent literature, documents, and aerial photographs. Supplemental information on the geology of the Park was acquired through examination of sediments exposed at various sites. Major habitat types also were identified during field work.

A base map of the area on which much of our data are presented was drawn from an aerial photograph (PWSY 1-48; 19 Nov 1981) obtained from Pacific Western Aerial Surveys, Santa Barbara. Topographic lines were added by projecting the USGS Lompoc Quadrangle onto the base map using a Map-O-Graph at the UCSB Map and Imagery Laboratory.

The botanical resources were investigated for approximately one year during eleven trips to the Park. These trips occurred on 13 July, 24 August, and 6-7 November 1982; and on 20 February, 13 March, 2 and 16 April, 1, 7 and 21 May, and 11 June 1983. Various service roads in

the Park were used for access to many areas, while other sites were accessible only by hiking. Vegetation was mapped initially from an aerial photograph (cited above). Boundaries of the plant communities were checked in the field, at which time the dominant and characteristic species were determined visually. The history of habitat disturbance and the response of the vegetation to disturbance was interpreted using aerial photographs covering a 45 year period. Upland plant communities were classified using Cheatham and Haller (1975) and vegetated wetlands were classified using Cowardin et al. (1979). Nomenclature of the vegetation is consistent with that suggested by these authors.

The vascular flora also was investigated during the eleven trips, and included primarily the native and naturalized species that grow at the Park. Numerous sites were visited regularly by the team to be certain that a majority of the species was recorded during each season for the various geographic areas, habitats, and plant communities. Voucher specimens were collected and deposited in the UCSB Herbarium. Information on the occurrence, abundance, habitats, plant communities, and associated species for each taxon was recorded, and an annotated catalogue of the plants was prepared.

Botanical resources of special concern, including both plant communities and taxa, were identified and described. This information was utilized in part to provide an analysis of the environmentally sensitive resource areas of the Park. Management recommendations are suggested that might enhance the quality or diversity of the botanical resources. It is certain that in an investigation of only one year not all species were discovered. Therefore, we would be most appreciative of new information concerning the occurrence of additional species.

PHYSICAL ENVIRONMENT

Location and Topography - La Purisima Mission State Historic Park covers 967 acres (39.1 hectares) and is located near latitude 34° 39' N and longitude 120° 25' W, about 4 miles (6.4 km) northeast of Lompoc in northwestern Santa Barbara County, California (Fig. 1). It is situated at the junction of several prominent physiographic features that contribute to its diverse topography. The southern foothills of the Purisima Hills occur to the northeast and form the eastern portion of the Park. The Burton Mesa, a low, flat-topped series of hills averaging 400 feet (133.3 m) in elevation, occurs to the northwest and apparently extends southeast into the Park, forming the western portion (Human, 1982). To the south the park boundary contacts the northeastern edge of Lompoc Valley, which in turn grades eastward into the Santa Rita and Santa Ynez Valleys. Approximately one mile (1.6 km) southeast of the Park are the western foothills of the Santa Rita Hills.

Los Berros Creek flows southward through the Park from the junction of the Purisima Hills and Burton Mesa to the Lompoc Valley. It lies in Purisima Canyon, which trends north-south through the Park. Thus within the Park there are three fairly distinct geomorphological terrains (Fig. 2). West of Purisima Canyon, rising above its surroundings, is a large, flat mesa that is up to 280 feet (93.3 m) above sea level and about 80 feet (26.6 m) above the canyon floor. In comparison, east of Purisima Canyon is a stream-dissected slope with moderate grades that has been eroded into a series of alternating canyons and well-rounded ridges, sloping uniformly westward toward the Canyon. The maximum height reached here is 360 feet (120 m), although the hills continue to rise

northeastward. The third feature is Purisima Canyon, characterized by flat bottomlands, an intermittent stream, an abruptly-rising western slope and a moderately-rising, dissected eastern slope drained by several tributaries with perennial springs and seeps (Fig. 3).

Climate - The Lompoc region is characterized by a Mediterranean climate with mild, moist winters and moderately warm, rainless summers. Point Conception, approximately 17 miles (27.4 km) southwest of the Park, has been considered (Barbour et al., 1975) as a major climatic boundary, illustrated by the relatively cool and moist conditions to the north and warmer and drier conditions to the east and south. The Park occurs in an area of transition between these two forms of Mediterranean climate.

The regional climate of the east-west trending Lompoc and Santa Ynez Valleys is influenced strongly by the prevailing westerly transoceanic air currents. The often strong westerly wind blows against the mesa, causing localized blow-outs in the sandy soils and wind-pruning of the vegetation along the west-facing slopes and their crests. The Mission was located on the eastern side of this mesa for protection from the wind (Engbeck, undated). There are, however, seasonal trends in air movement that shift from night and early morning offshore air movement in the winter, driven by continental cooling, to calm morning air and onshore afternoon breezes in the spring and summer. Strong northwest winds of one or two days duration may occur following the passage of cold fronts in winter and early spring. Late afternoon and early evening are characterized by the onshore breezes or winds during most of the year, but these are strongest and most regular in the late spring and early summer as a result of seasonally increasing daytime convection in the interior. A layer of fog or low overcast, resulting from the same

FIGURE 1. INDEX MAP

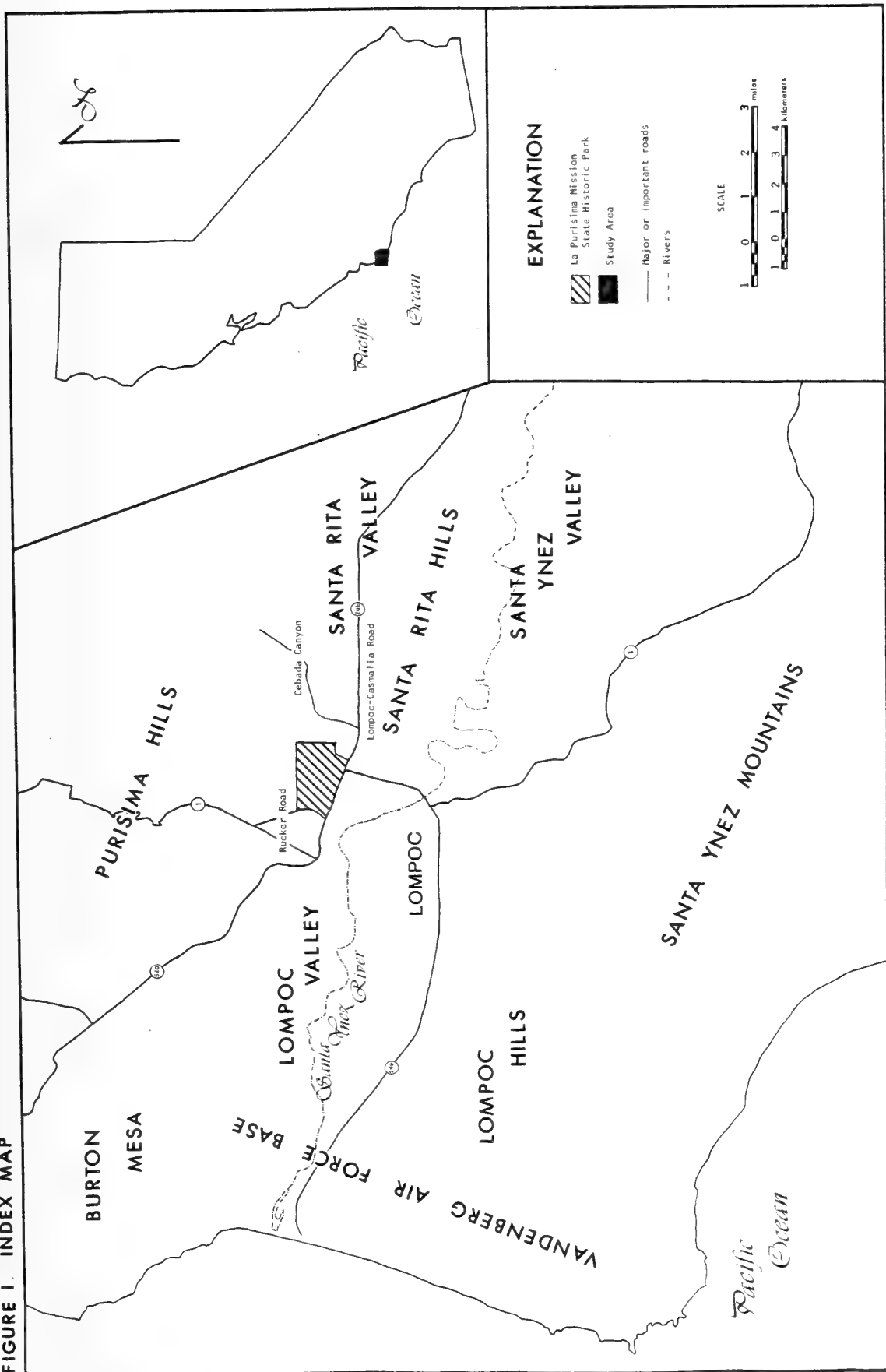
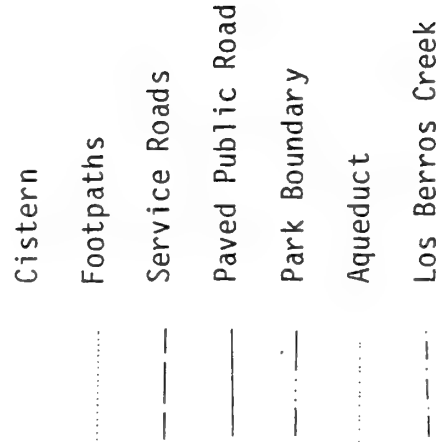


FIGURE 2. LA PURISIMA MISSION STATE HISTORIC PARK



La Purisima Mission State Historic Park

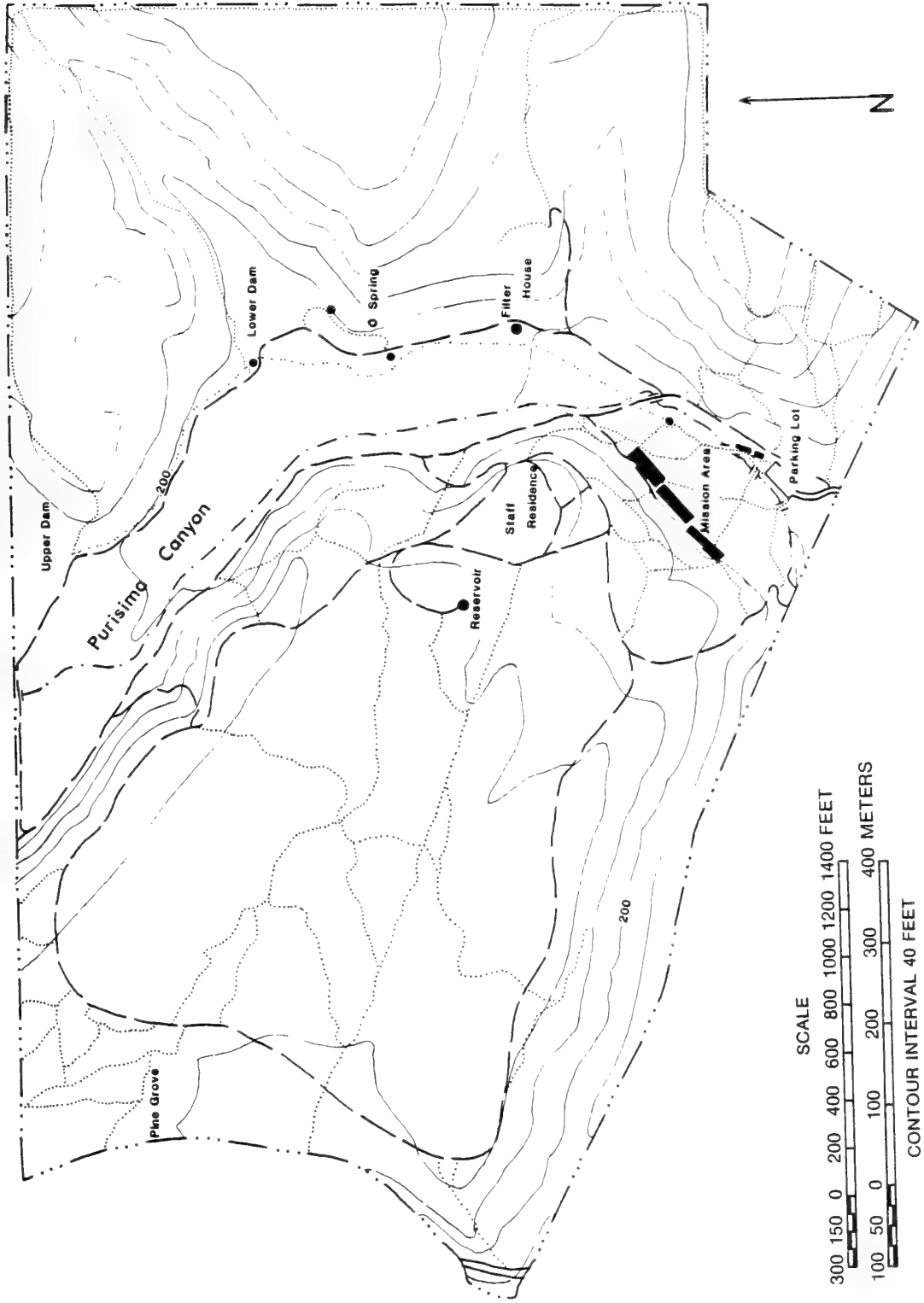




Fig. 3. Purisima Canyon: View from "Cross" on eastern side of canyon, northwestward to the Purisima Hills (background). La Purisima Mission and Lompoc Valley occur out-of-sight and down canyon to the southwest. Burton Mesa occurs to the west (left), foothills of the Purisima Hills to the east (right) and tree-lined Los Berros Creek on the canyon floor (left-center). Also visible are the east and west (El Camino Real) canyon roads, the stone aqueduct that traverses the cultivated field, the wetlands associated with the lower reservoir (upper right-center), filterhouse (right-center), and smithy (lower left-center). A new channel, cut by overflow from Los Berros Creek in 1983, traverses the cultivated field.

onshore flow combined with an atmospheric inversion that traps cool moist air at low elevations, characterizes this coastal region and is heaviest during late spring and early summer mornings.

Temperature and precipitation data have been recorded for Santa Maria, approximately 20 miles north of the Park (Table 1). The region is characterized by relatively cool summers and mild winters. This is illustrated by the average temperature in the warmest month (September) that is only about 13° higher than the coolest month (January). The average minimum temperature in the coolest month is well above freezing and there is a considerable lag in the summer warming trend. These phenomena are due in part to the maritime nature of the region.

TABLE 1. Temperature and Precipitation Data From Santa Maria, Santa Barbara County (Elford, C.R., 1972)

Month	Temperature					Precipitation
	Maximum (°F)	Average maximum (°F)	Average (°F)	Average minimum (°F)	Minimum (°F)	Average (in.)
January	82	62.3	50.2	38.1	21	2.84
February	87	63.1	51.8	40.4	24	2.50
March	88	64.6	53.3	41.9	29	2.06
April	97	66.4	55.6	44.7	31	1.19
May	93	68.1	57.6	47.1	34	.22
June	95	69.5	59.6	49.7	36	.14
July	104	71.6	62.2	52.8	43	.03
August	93	71.9	62.4	52.9	43	.03
September	102	74.1	62.8	51.5	36	.16
October	103	73.3	60.4	47.5	30	.60
November	93	70.4	56.1	41.8	25	1.02
December	90	65.0	52.4	39.8	26	2.58
Year	104	68.4	57.0	45.7	21	13.37

Precipitation in northwestern Santa Barbara County has a mediterranean pattern: winter rain and summer drought. Over 90% of the average annual precipitation falls during a six-month period (November to April).

The average total rainfall for May through September is under one inch. July and August are the driest months and December through February are the wettest. The summer drought is probably ameliorated by the cool temperatures and high humidity. The environmental conditions of La Purisima Mission are even more moderate from those sites for Santa Maria. There are fewer frost nights in winter and fewer hot days in summer.

Geology - Though only one formation (Fig. 4) is mapped, two formations are found within the Park. The older, late Pliocene/Pleistocene Paso Robles Formation was found exposed in only one location - at a roadcut above Rucker Road, near the intersection of Rucker and Lompoc-Casmalia Roads. According to Dibblee (1950), the Paso Robles Formation is made up of poorly consolidated conglomerates, sandstones and clays. At the roadcut, it is composed of lenses of pebble and cobble conglomerate interbedded with finer, silty sandstones and siltstones. All of the sediments are poorly sorted and are crossbedded in places. The coarser conglomerates form channels in the finer sediments suggesting that the rocks were deposited by streams, possibly on an alluvial floodplain.

The Orcutt Formation is younger, reaches its maximum thickness of 150 feet in the western Purisima Hills and, though undetermined, may have a comparable thickness in the Park. This formation has an unconformable lower contact, a shallow south dip, and is composed of unconsolidated, medium grained, massive, light tan sand. It was probably derived from beaches towards the west, from which it was carried and deposited by wind during the Quaternary Period.

Quaternary alluvium fills all major stream channels and canyons. In the Park, the northern portion of Purisima Canyon has loamy silt with

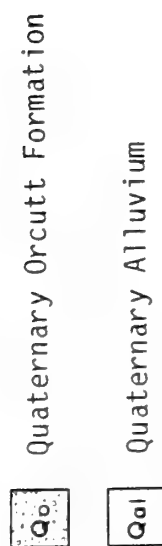
small quantities of sand and gravel. To the south, this depth undoubtedly increases and the alluvium reaches its maximum thickness where the canyon opens up into Lompoc Valley. In this area, according to Upson and Thomasson (1951), the depth of the alluvium in northeastern Lompoc Valley is 170 feet, composed of 120 feet of sand and clay and 50 feet of underlying gravel.

Regionally, the rocks that underlie the Orcutt Formation, in the area of Lompoc Valley, Burton Mesa, and the Purisima Hills, have been folded into a series of alternating major and minor folds that trend approximately N75°W. Generally, valleys correspond to synclines, and ridges or hills to anticlines. Both the Purisima and Santa Rita Hills are anticlines. Northeast of the Park, the Purisima Hills outline the Purisima Anticline. Northwest of the Park, in the Lompoc Oil Fields, the Purisima Anticline grades into the Lompoc Anticline (Dibblee, 1950).

West and southwest of the Park, the Burton Mesa and Lompoc Valley are made up of rocks that have undergone considerably less deformation than those in the Purisima Hills. According to Dibblee (1950), the lesser amount of deformation west of the Park may be due to a wedge of Franciscan Formation, approximately 3000 feet (915 m) below the surface and beneath the Lompoc Anticline, that broadens towards the ocean and pinches out in Santa Rita Valley. This wedge may have been stabilized by earlier periods of deformation and thus may be less responsive to compression, making the overlying rocks also less susceptible to this compression.

The Orcutt Formation made it impossible without drilling to determine positively the structure within the Park. However, from geomorphological evidence and previous work, a possible structure can be

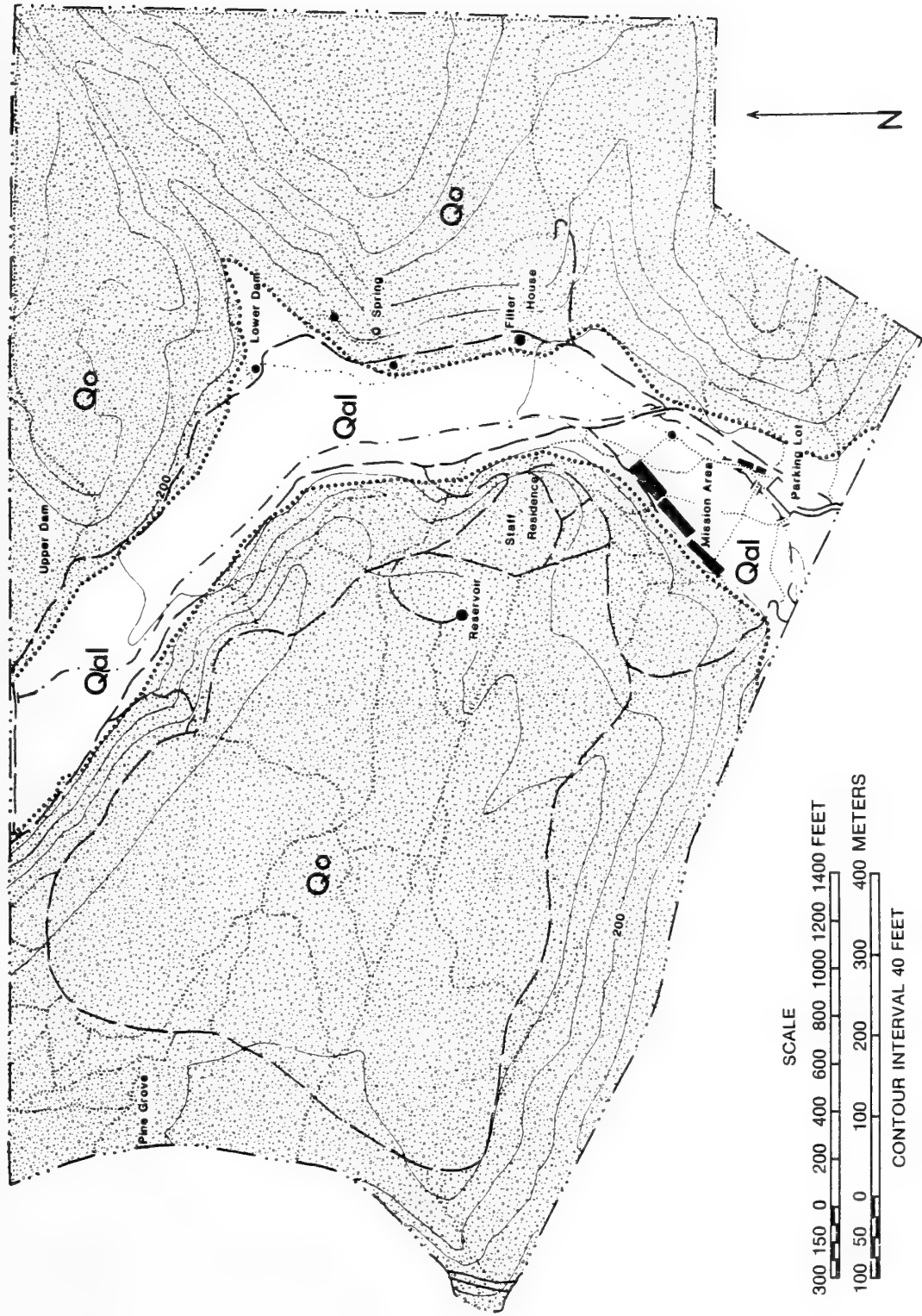
FIGURE 4. GEOLOGY



The Orcutt Formation is the only geologic formation mapped within La Purisima Mission State Historic Park. However, Quaternary alluvium fills all major stream channels and canyons in the Park. There are two fairly distinct geomorphological terrains: 1) a large, flat mesa that rises abruptly to the west of Purisima Canyon; and 2) a stream-dissected slope with a moderate grade that rises to the east. The map below was adapted from Dibblee (1950).

La Purisima Mission State Historic Park

Lompoc, California



deduced. According to Woodring and Bramlett (1950) the Santa Rita Syncline extends as far west as southern Cebada Canyon, just east of the Park. Because Purisima Canyon bends from a nearly north-south trend north of the Park to a northwest-southeast trend in the northern half of the park, it becomes more or less parallel to the location in which the Santa Rita Syncline would be found if it extended westward. Thus, the geologic structure of the Orcutt Formation in the Park might be that of a syncline and the location of Purisima Canyon in the Park might be due to the alignment of Los Berros Creek with the trough of the Syncline.

The geologic history of the Lompoc Region has been discussed in detail by Dibblee (1950). Although most of this history will not be summarized here, some events of the recent geologic past were important in the development of land forms within the Park. These current land forms provide the major habitats that support the present plant communities.

The San Rafael Uplift, occurring in the Burton Mesa and Purisima Hills during the Oligocene, exposed various formations to extensive erosion. Uplift in northern Santa Barbara County came to an end in the late Miocene, not to resume until the Pleistocene. In the late Miocene, the San Rafael Uplift subsided beneath sea level and deposition began of the Monterey and younger Sisquoc Formations, the oil and diatomite bearing formations in the northern Santa Barbara area. The subsidence was of fairly long duration, continuing throughout the late Miocene, Pliocene and into the early Pleistocene.

Submergence came to an end in the Pleistocene with the development of the San Rafael and Santa Ynez Mountains. The forces that formed these mountains influenced the area in several ways. They increased sedimentation rates to fill valleys and drive back the sea, caused considerable

deformation that further tightened preexisting folds, and in the Purisima Hills formed the anticline that shapes them today.

From the middle of the Pleistocene to recent times, the area has been exposed to at least two erosional cycles. The first cycle, in the late Pleistocene, reduced Burton Mesa to a flat plain and rounded off the Purisima Hills. Subsequently, much of the lowlands, including Burton Mesa and the southwestern flank of the Purisima Hills, were buried under the wind-blown Orcutt Formation. Following erosion, sediments from the neighboring hills and mountains filled Lompoc and Santa Ynez Valleys. Later, in the Pleistocene, four stages of uplift raised the hills and mountains to their present heights and triggered the second period of erosion. It was during this time that the land forms in the Park were initiated. Down-cutting of canyons by stream channels was resumed, Burton Mesa was partially cut by new channels, and lateral erosion formed and eventually filled the flood plains that comprise Santa Ynez and Lompoc Valleys.

Water is one of the most valuable resources of the Park and is available as a result of the geologic structure of the area. Several springs and seeps are located at the base of the hills along the east side of Purisima Canyon, with at least one seep west of the Canyon on the southern portion of the Park. These springs are an important factor in determining the diversity of wetland vegetation. They also were invaluable to the Mission during the early to middle 1800's. Today, several of the original structures designed to make this water available to the Mission have been restored, including several cisterns, the filterhouse, and a stone aqueduct (Fig. 2).

Soils - Within the Park there are three major subdivisions of soils that have been derived from the Orcutt Formation: the Arnold, Elder, and Marina Series. These are further subdivided into 8 members according to slope (Fig. 5). The Arnold sand is an excessively-drained soil that is light brown to very pale brown. It extends to a maximum depth of 55 inches (141 cm), becoming very pale brown, soft and porous beneath. In the Park it is found at elevations from 200 to 360 feet (61-109 m), and is subdivided into two members: ArD, (5 to 15% slopes), is an average of 40 inches thick; and ArF, (15 to 45% slopes), is more porous, and is 40 to 60 inches (103-154 cm) thick. According to Shipman (1972), the Arnold soils support a wide range of vegetation. He states that north-facing slopes support a dense growth of oaks with a sparse undercover composed of annual grasses, forbs, and Central Coastal Scrub. In comparison, south-facing slopes are much less densely vegetated and are covered with a greater number of grasses, herbs and shrubs, and fewer, widely-scattered oaks. Within the Park, Arnold sand is not mapped on any north-facing slopes.

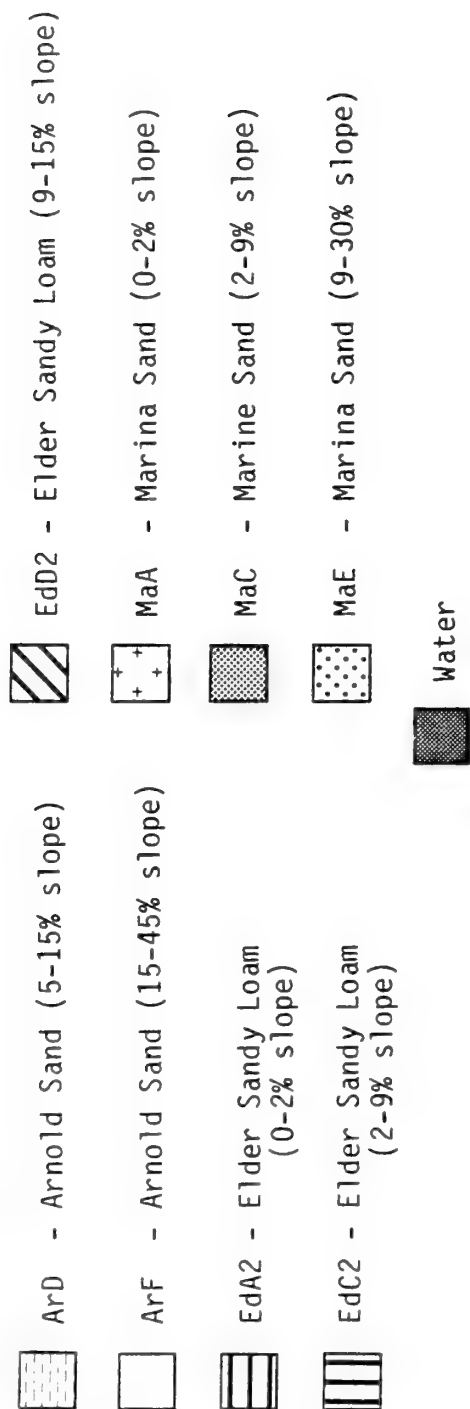
The second series, the Elder sandy loam, is a well-drained soil with a surface layer 23 inches (59 cm) thick, made up of dark gray sandy loam that is underlain by a light brownish-gray stratified sandy loam which contains some finer components. In the Park it is found primarily within Purisima Canyon where it occurs on slopes of 0 to 15% from an elevation of 120 to 200 feet (39.6-61 m). It has been subdivided into three members: EdA2 (0 to 2% slopes); EdC2 (2 to 9% slopes); and EdD2 (9 to 15% slopes). Elder soils support a variety of annual grasses, forbs, and oaks (Shipman, 1972). Within the Park, most of the Elder soil has either been cultivated, or is wetland.

The last series, the Marina sand, is an excessively-drained sandy soil composed of approximately 23 inches (60 cm) of light brown loamy sand, containing thin clay bands overlying light brown pink sand that extends to a depth of 60 or more inches (154 cm). The three members in the Park are as follow: MaA (0 to 2% slopes); MaC (2 to 9% slopes); and MaE (9 to 30% slopes). Shipman (1972) states that Marina soils support a sparse population of annual grasses, forbs, brush, and scrubby live oaks. However, within the Park Marina sand tends to support a dense mixture of Central Coastal Scrub, Chamise Chaparral, and scattered oaks on north-facing slopes, and Mixed Central Coastal Scrub and annual grasses on south-facing slopes.

History and Land Use - The history of La Purisima Mission (Mission La Purisima Concepcion de Maria Santisima) has been documented in a booklet, published by the State of California, Department of Parks and Recreation (Engbeck, undated), from which this summary was made.

La Purisima Mission was the eleventh mission to be established in California. The original site was at Lompoc where construction began in 1788. That mission was destroyed by an earthquake in 1812. Purisima Canyon (La Canada de Los Berros or the Canyon of Watercress) was chosen as the new site because of the adequate supply of water, good soil and location on El Camino Real. The first building was completed in 1815. The total Native American population in the vicinity of the Mission was about 1000 during the first year but declined to 662 by 1824 and to 160 by 1846. La Purisima Mission was abandoned in 1834, following secularization of the missions, and began to fall into ruin after 1836. During the early 20th century the remaining ruins were slowly covered by drifting silt and sand.

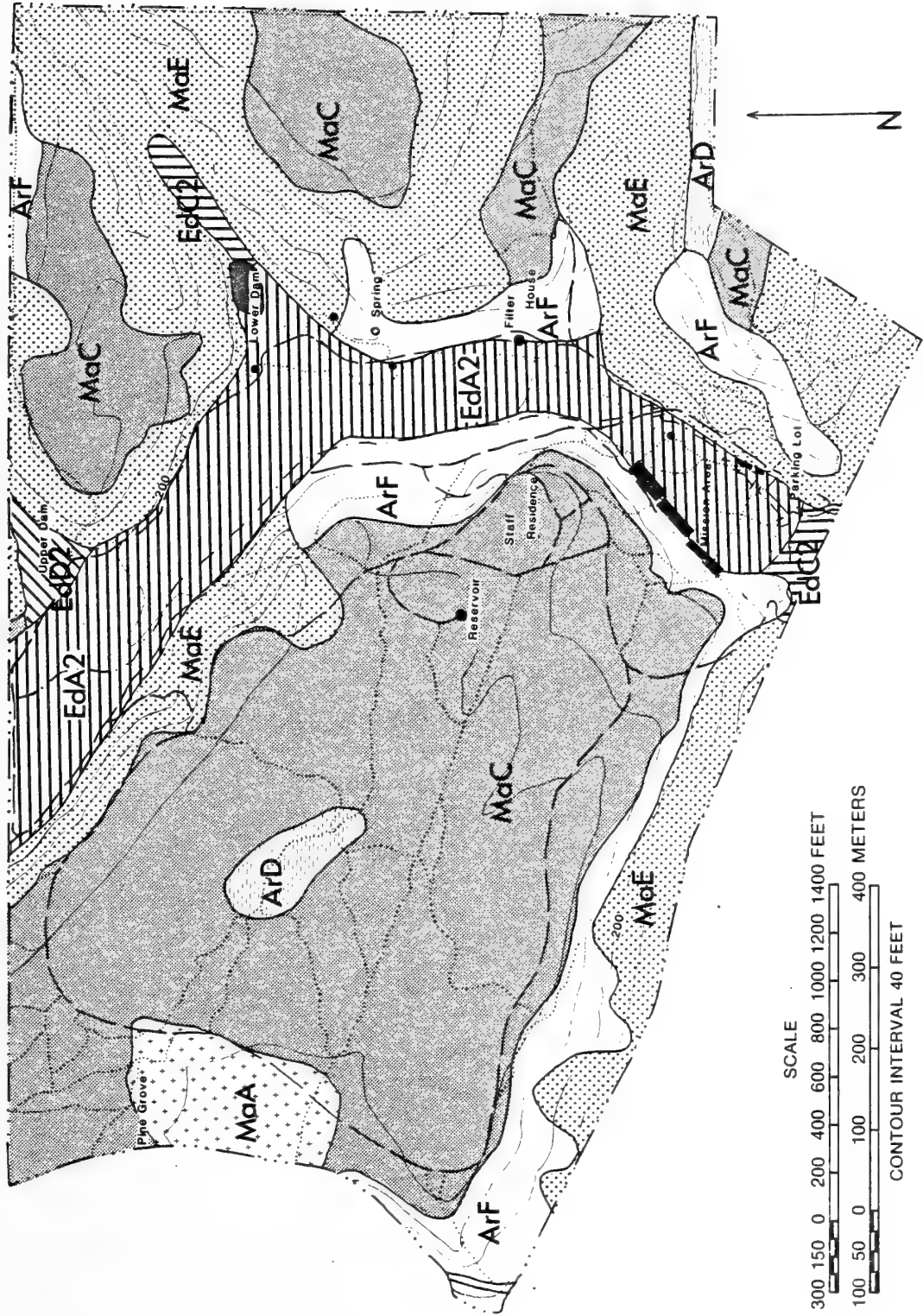
FIGURE 5. SOILS



La Purisima Mission State Historic Park is characterized by three major subdivisions of soils, the Arnold, Elder, and Marina Series. These are further subdivided as illustrated below (Shipmen, 1972). In general these soils are sands or sandy loam that are well-drained or excessively-drained and occur on a wide variety of slopes.

La Purisima Mission State Historic Park

Lompoc, California



Restoration of the site by the Civilian Conservation Corps (CCC) began in 1934 and continued through 1941. Various parcels of land were donated by the Catholic Church and Union Oil Company. Santa Barbara County and the State joined to purchase additional land, bringing the total holdings to 507 acres (205.2 hectares) before construction began. It was originally named La Purisima Mission State Historical Monument. A nursery was established by the CCC to landscape the area once restoration was completed.

Land use during the mission period included cultivation of the bottomlands of Purisima Canyon and grazing by cattle and sheep. Additionally, an extensive water system, including dams, reservoirs, aqueducts, filterhouse, and cisterns was constructed. Native American use of the area included the gathering of seeds and use of local plants in making baskets. They also may have burned vegetation to promote annual species of plants they harvested for food (J. Timbrook, Santa Barbara Museum of Natural History, personal communication).

Subsequent land use and significant disturbances within the Park have been mapped and interpreted using a series of aerial photographs (Fig. 6). These include cultivation of areas, removal of vegetation and construction of firebreaks. A chronological sequence for these disturbances is described in the caption for Fig. 6 and the effects of these disturbances are described in the section BOTANICAL RESOURCES.

Habitats - Habitats of the Park are defined largely by the geology, soils, climate, and land use practices. Geological deformation of sand deposits and erosion are responsible for the general geomorphology of the area. The sediments and soils produced by these processes and the availability of water contribute to the nature of the substrates. The

Mediterranean climate of the region, including strong coastal influences, is an important environmental factor with characteristic wind, temperature and precipitation regimes affecting the nature of the habitats. Furthermore, the history of land use and habitat disturbance, including agriculture, access, vegetation removal, arson fires, and development of water resources, have contributed significantly to the status of habitats for the botanical resources.

Habitats of the Park include two major types - upland areas and wetlands. Wetland habitats are characterized by substrates that are either seasonally or permanently flooded or that have water tables at or near the surface. Vegetated wetlands are dominated by hydrophytes that are adapted to growing in undrained hydric soils. All other habitats belong to the upland type and are characterized by well-drained soils.

Upland habitats of the Park include major geomorphological features such as mesas, ridges, and slopes. Variations within these features include disturbed areas such as roads, scraped areas, wind-blown exposures, cultivated areas, mission grounds, and burns. The prominent mesa west of Purisima Canyon (Fig. 2) is characterized by a nearly flat-topped portion as well as a west and southwest sloping area and a small ridge along the northeastern margin. Excessively-drained soils characterize much of the area, although those on the uppermost plateau are more compacted than those on the gently-sloping lower plateau of the southwestern portion of the mesa. Some areas with exposed substrates contain open, wind-blown, sand habitats; others include sandstone outcrops or exposed sand and gravel in beds of roads and trails.

Moderate to steep slopes are major features of the Park and are important habitats for plants because the grade and direction of slope

FIGURE 6. LAND USE AND DISTURBANCE HISTORY

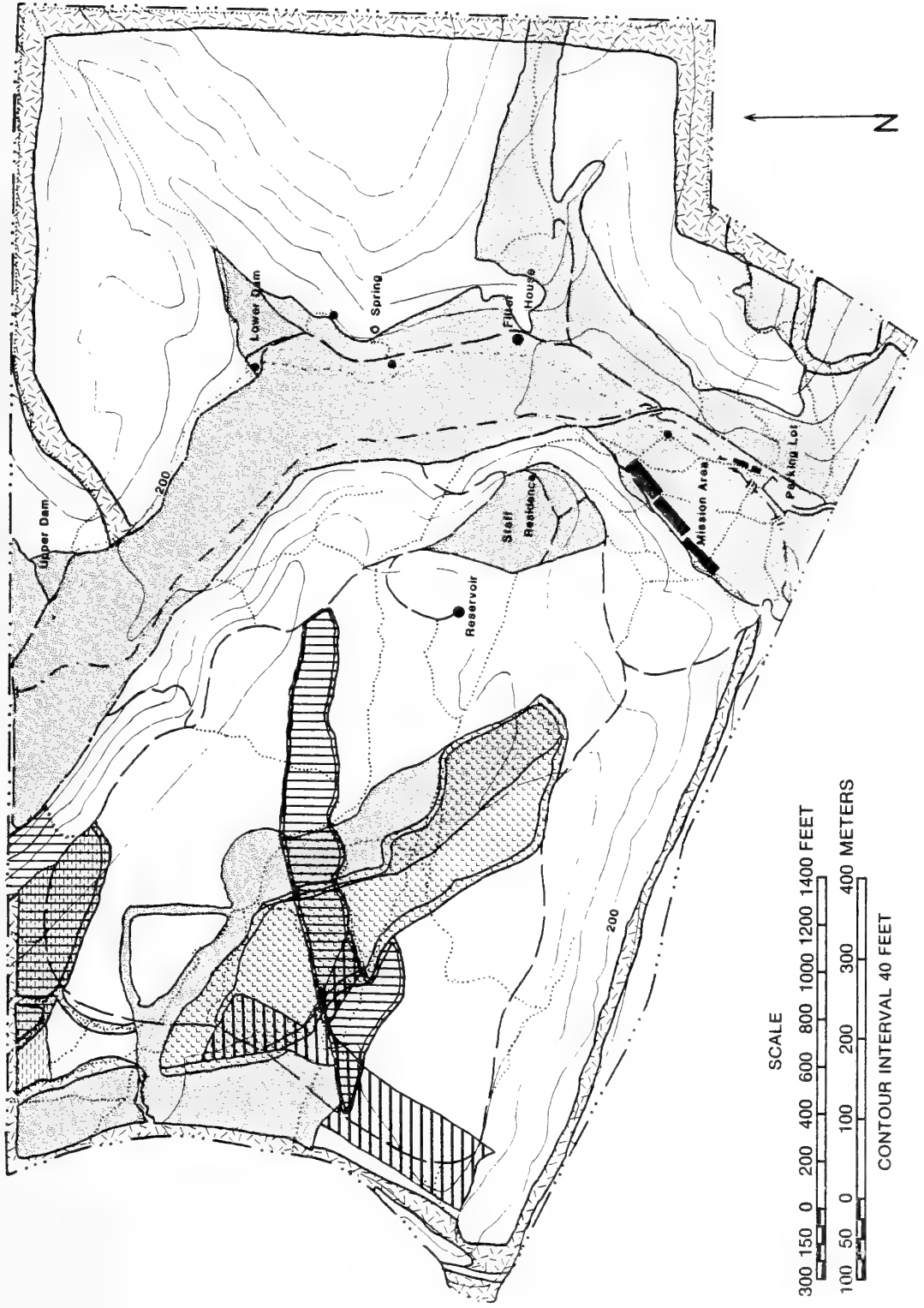
Date of Aerial Photographs & Estimated Period of Disturbance



Interpretation of aerial photographs revealed extensive disturbance of the Park landscape. The oldest photograph available (1938) illustrated that a portion of the western mesa had been disturbed at some earlier date and vegetation had recovered to a point where open Woodland Chaparral was present. The majority of disturbance that appears to be contemporaneous with the 1938 photograph probably dates back to the establishment of the Mission in Purisima Canyon (ca. 1815). However, much of this same area was probably cultivated in 1938. Furthermore, restoration of the Mission buildings and grounds and construction of park staff residences began in 1934. In addition to cultivated areas in Purisima Canyon and adjacent sites, the dam and reservoir are included in the map. Other disturbance for this period included removal of vegetation along the western margin and central area of the mesa. Sometime between 1938 and 1954 more vegetation was removed from the northern portion of the mesa as well as from an extensive area north of the Park. This site was completely revegetated by 1954, but by a contrasting community type. Contemporaneous with 1954 was the construction of a firebreak around much of the perimeter of the Park, during which virtually all vegetation was removed from the break except a thin band within the break. By 1961 the Mission Hill's housing development had been built north of the Park. Within the Park a major firebreak had been constructed on the mesa to contain an arson fire. Another arson fire that trended east/west across the mesa was contained by a firebreak during or prior to 1974. Park records show that a burn occurred from the vicinity of Lookout Point over the southwestern bend in the mesa service road, eastward to the park staff residences. It was probably a low energy fire, as no evidence of it appeared on the 1974 aerial photograph. Currently the bottomlands of Purisima Canyon are cultivated and service roads and grounds of the Mission and park staff residences are maintained. Most firebreaks were abandoned after 1961.

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affect the vegetation profoundly. The most prominent feature of this type in the Park is the well-dissected slope along the east side of Purisima Canyon. It is characterized by a moderate grade rising to the east. This slope is dissected by canyons that drain into Purisima Canyon and are separated by well-rounded, west-sloping ridges or divides. These divides are composed of predominantly north- and south-facing slopes that provide strongly contrasting environmental conditions influenced most by differential exposure to sunlight. The lower slopes and margins of bottomlands of canyons serve as sinks for sand eroded from the divides. These sands are usually deep and loose, resembling habitats of coastal dunes. Such habitats also are found locally on mesas, where they may occur either in basins, at wind-blown exposures, or on disturbed surfaces. In general, the Park is characterized by many slopes which are oriented in various directions and have various substrates, thus providing a series of habitats with different growing conditions.

Additional upland plant habitats are influenced strongly by the activities of man. Cultivated areas, such as the floor of Purisima Canyon, mission grounds, and the various plantations, provide habitats not only for cultivated plants, but also for numerous naturalized and weedy native species. Furthermore, disturbed surfaces along roads, trails, and scraped areas are habitats for many species.

Most wetland habitats of the Park have been altered significantly, and although many natural areas exist, most have been affected by historical or current operations connected with La Purisima Mission. For example, the bottomlands of canyons that dissect the eastern slope are apparently natural wetlands, but dams erected during the 19th century created reservoirs that flooded the bottomlands. These reservoirs have

filled largely with silt and support extensive vegetated wetlands. They are undoubtedly different from the original wetlands even though they are dominated by many native hydrophytes. A pond still existing behind the upper dam in the Park contains habitats that did not exist before impoundment of the canyon. Likewise, the stone aqueduct and various cisterns are man-made wetland areas that support hydrophytes. Several natural seeps along the eastern side of Purisima Canyon are the source of water for the largely perennial wetlands (i.e., reservoirs, aqueduct). Other habitats, for example Los Berros Creek and upstream bottomlands of canyons, are flooded or contain saturated soils only seasonally.

BOTANICAL RESOURCES

Vegetation

Although there have been some investigations of the vegetation of Burton Mesa and the Purisima Hills (e.g., Barbour & Johnson, 1977; Cole, 1980), no comprehensive work has been conducted at La Purisima Mission State Historic Park previous to our investigation. The oldest vegetation map for the site (Burk, 1941) has poor resolution and was made when the Lompoc Quadrangle was mapped during the determination of vegetation types in California for the Forest Service and California Range and Experiment Station. Plant communities listed in that work for the vicinity of the Mission include sagebrush, Chamise Chaparral, grasslands, and sagebrush with a mosaic of woodland species, in addition to cultivated areas.

Current vegetation of the Park (Fig. 7) consists of two basic types, upland and wetland. They are dependent largely upon the type of water regime influencing substrate conditions (see: Physical Environment). Furthermore, the distribution of various plant communities (Figs. 8 & 9) is related closely to habitat, particularly geomorphologic features, substrate, and the history of disturbance for each site. The following are descriptions of the various categories of vegetation interpreted during this study. They are grouped according to the two basic types, and subsequently according to standard classification schemes.

Upland Vegetation - Vegetation of uplands (Fig. 7) was classified (Appendix I) according to Cheatham and Haller (1975), and consists of 5 major categories (Dune, Scrub and Chaparral, Grasslands, Woodlands, and Forests), containing a total of 11 subdivisions or "communities." These

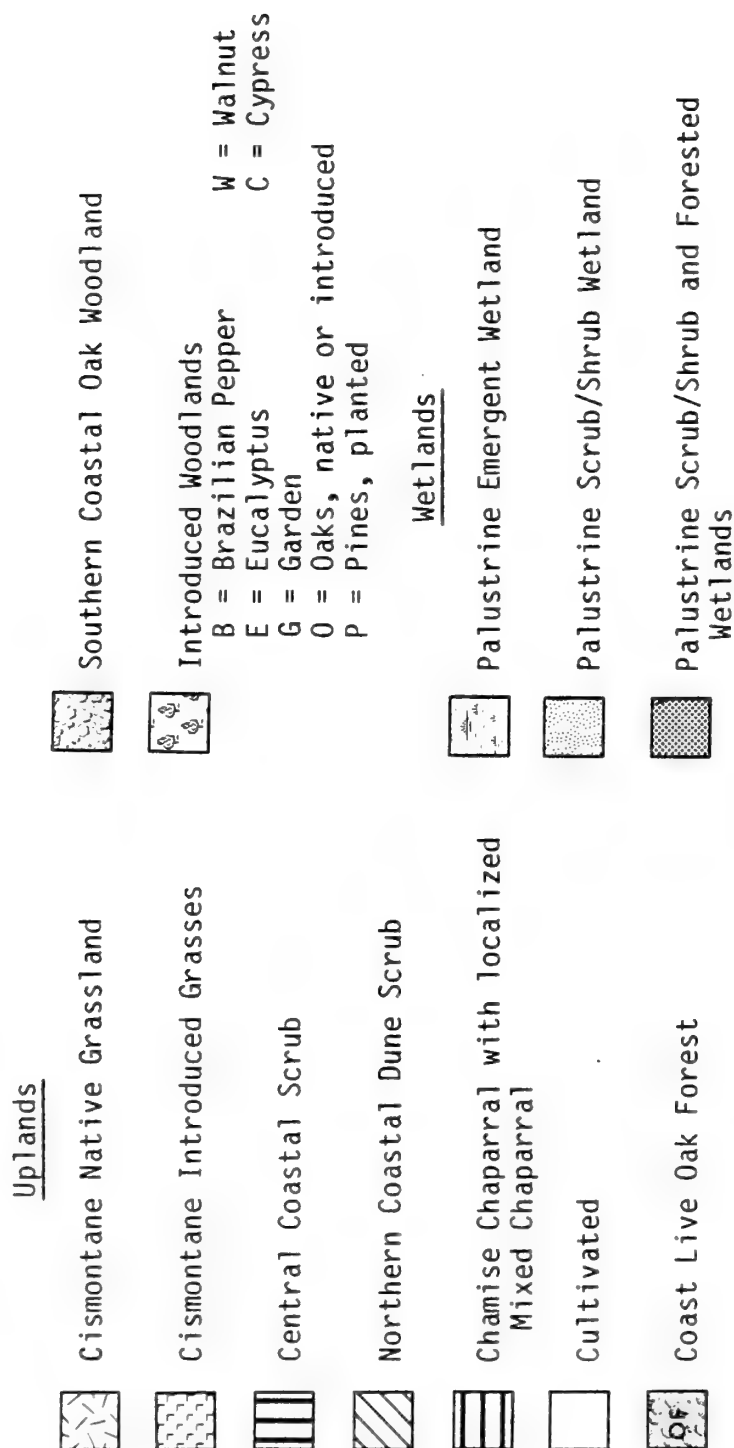
communities are described below in the order in which they appear in this classification.

NORTHERN COASTAL DUNE SCRUB - Usually restricted to dune systems closer to the coast, this community at the Park occurs largely on the excessively-drained Marina sand, particularly where the sand is deep and loose. As a mapped unit, it is restricted to only a few localities, but occurs on several physiographic features, including mesa flats and ridge slopes. It appears as an open scrub community, having numerous herbaceous species and smaller shrubs occurring in a grassland association.

Characteristic species of this community are listed in the Classification of Upland Vegetation (Appendix I). The distributions of several dominant species are illustrated in Fig. 10, as are those of Central Coastal Scrub, a community with which Northern Coastal Dune Scrub often intergrades (Cheatham & Haller, 1975). Lupinus chamissonis and Ericameria ericoides are perhaps the most characteristic species that occur in examples of this community from the immediate coast as well as the study area (Fig. 11). The presence of Lupinus albifrons, and other dominant shrubs more characteristic of non-coastal communities, indicates the inland nature of this variation of Northern Coastal Dune Scrub.

Perhaps the most well-developed example of dune scrub at the Park is located on the western mesa along a service road just west of park staff residences (Fig. 12). A check list for the species occurring here (Locality 1) has been compiled (Appendix V). Of particular interest at this site is the westward transition of Northern Coastal Dune Scrub upslope to Central Coastal Scrub and California Mixed Chaparral. Chaparral species occurring in this transition zone include Adenostoma

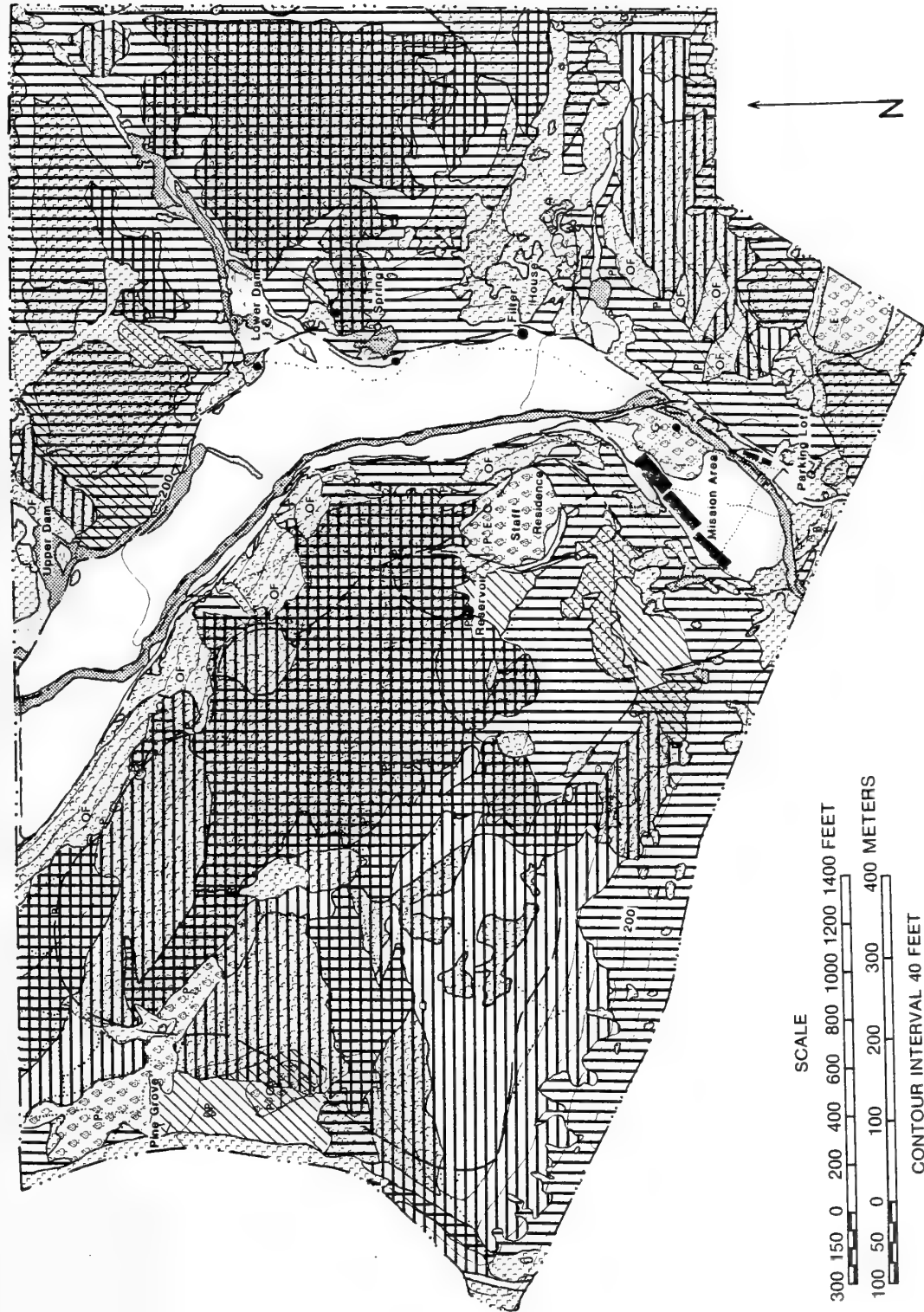
FIGURE 7. VEGETATION



The vegetation of La Purisima Mission State Historic Park consists of many plant communities and is characterized by complex spatial relationships among these associations. The general distribution of these communities is illustrated below. Many habitats within the Park support elements of more than one community. These transitional areas are represented by overlapping symbols. The vegetation was interpreted through visual determination of dominant species and the distribution of associates. However, the map does not illustrate the frequency, abundance or diversity of the dominant species. Boundaries of the communities were delineated by initial mapping from an aerial photograph and by subsequent checking of the preliminary boundaries during field work.

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SCALE

300 150 0 200 400 600 800 1000 1200 1400 FEET

100 50 0 100 200 300 400 METERS

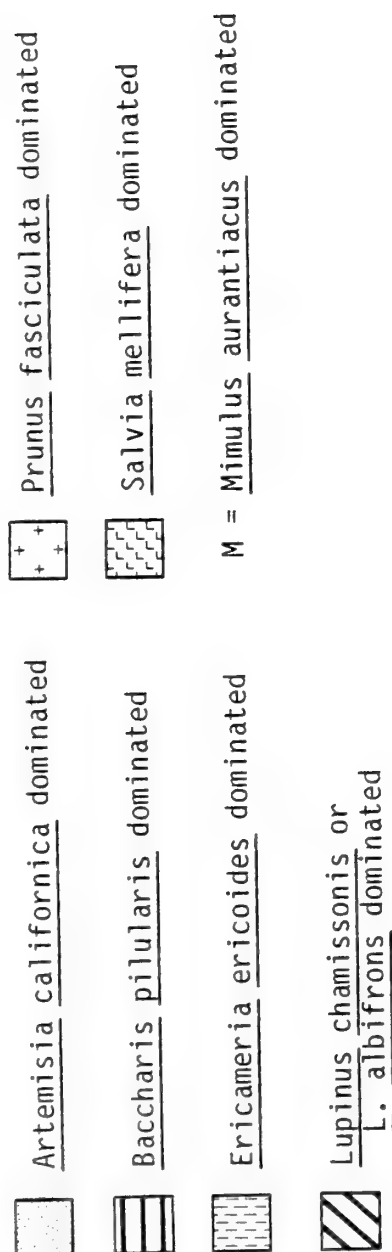
CONTOUR INTERVAL 40 FEET

Fig. 8. Filterhouse Canyon, Upper Portion: View from area of the "Cross" northward to the Purisima Hills (background). The south-facing canyon slope is characterized by Central Coastal Scrub, Chaparral, and Coast Live Oak toward the west (upper center) and Cismontane Introduced Grasses and scattered Central Coastal Scrub (lower center). The north-facing slope (lower portion of photo) is characterized by Coast Live Oak Forest and Chaparral on the lower portion and Central Coastal Scrub and Cismontane Introduced Grasses on the upper portion and west.

Fig. 9. Filterhouse Canyon, Lower Portion: View from the "Cross" northward to the Purisima Hills (background). Vegetation in view is similar to that of Fig. 8. Cultivated trees at an old homestead are visible (right-center), as is the filterhouse (left). Vegetation on the upper south-facing slope (center-left and -right) is dominated by Cismontane Introduced Grasses and mixed scrub vegetation. The north-facing slope (foreground) is characterized by Chaparral and the canyon floor (lower left) by Palustrine Scrub/Shrub Wetland.



FIGURE 10. DOMINANTS OF CENTRAL COASTAL SCRUB & NORTHERN COASTAL DUNE SCRUB



The general occurrence of Central Coastal Scrub and Northern Coastal Dune Scrub is illustrated in Figure 7. The distribution of selected shrubs occurring as dominants of these communities is illustrated below. Symbols that lack a line marking their boundary represent either a transitional area in the distribution of a dominant species or areas in which the boundary could not be determined. Three dominants, Corethrogyne filaginifolia, Eriophyllum confertiflorum, and Lotus scoparius, were not mapped. Corethrogyne filaginifolia occurs commonly throughout most of these communities and also in Cismontane Introduced Grasses. Eriophyllum confertiflorum generally is found in the sandier soils of Northern Coastal Dune Scrub with Baccharis pilularis, Ericameria ericoides, and Lupinus spp. Lotus scoparius is associated more regularly with Central Coastal Scrub and in areas characterized by both scrub and chaparral. It is found commonly with Artemisia californica, Ericameria ericoides, Prunus fasciculata, and Salvia mellifera.

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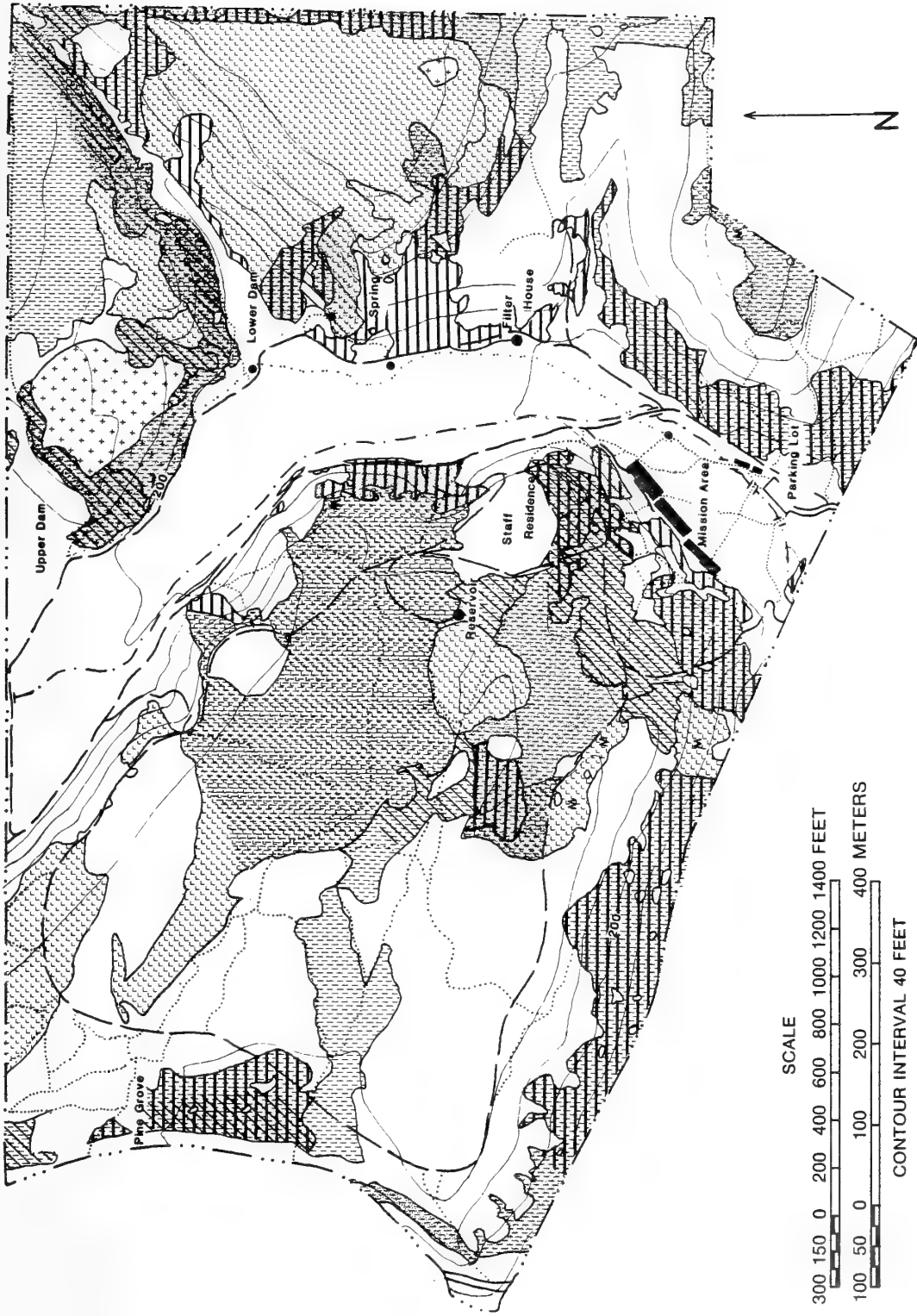


Fig. 11. Northern Coastal Dune Scrub: View from vicinity of Upper Reservoir, southeastward over the western portion of canyon divide. The site is a west-facing slope characterized by loose, loamy sand. Dominant shrubs include Artemisia californica, Ericameria ericoides, Lupinus albifrons, L. chamissonis, and Rhamnus californica. Dominant herbaceous perennials or subshrubs include Croton californicus and Horkelia cuneata. Numerous annuals occur among the shrubs, such as Bromus spp., Cryptantha clevelandii, Lasthenia californica, Layia glandulosa, Orthocarpus purpurascens, Senecio californicus, and Vulpia myuros.

Fig. 12. Northern Coastal Dune Scrub: View from service road west of park staff residences, northward across the southern portion of the western mesa. This broad shallow depression on the mesa has a substrate of loose sand, in contrast to the more compacted substrates of much of the higher plateau in the background. Dominant shrubs include Artemisia californica, Corethrogyne filaginifolia, Ericameria ericoides, Eriophyllum confertiflorum, Lupinus albifrons, L. chamissonis, and Rhamnus californica. An extremely diverse herbaceous flora is characteristic of this site. This community is transitional to both Central Coastal Scrub and Mixed Chaparral on the slope in the background. Coast Live Oaks appear on the horizon, scattered through the scrub and chaparral vegetation.



fasciculatum, Arctostaphylos rudis, Ceanothus ramulosus, C. impressus, Leptodactylon californicum, Mimulus aurantiacus, and Salvia mellifera. Scattered oaks (Quercus agrifolia) and many widespread shrubs (e.g., Artemisia californica, Rhamnus californica, R. crocea) also occur here. This association is quite similar to scrub vegetation occurring nearby on the inland coastal dunes at Vandenberg Airforce Base, where dune scrub has been suggested as successional to chaparral (Barbour & Johnson, 1977).

CENTRAL COASTAL SCRUB - This community is developed best on south-facing slopes with well-drained or excessively-drained soils, such as the Marina sand with a 9-30% slope (Fig. 5). Examples occur on divides of the dissected eastern slope of Purisima Canyon (Fig. 13). Central Coastal Scrub can appear in several forms: 1) as dense scrub vegetation with dominants including from one to many shrub species; 2) as scattered shrubs in a grassland setting; and 3) in mixed associations with plants from adjacent communities. It is transitional between Northern Coastal Scrub and Coastal Sage Scrub and contains occasional individuals of at least one southern species (Encelia californica), a plant that reaches its northern limit near the Park and is characteristic of Coastal Sage Scrub of southern California.

Species characteristic of Central Coastal Scrub are listed in the Classification of Upland Vegetation (Appendix I), and the occurrence of several dominant species is illustrated in Fig. 10. Dominants vary depending on the geographic location within the Park, the nature of the habitat, and the degree of disturbance. For example, Prunus fasciculata var. punctata is codominant with a number of species (e.g., Artemisia californica, Ericameria ericoides, Eriophyllum confertiflorum, Phacelia

ramosissima, Rhamnus spp., and others) in open scrub and grassland on the eastern slope of the Park, but does not occur anywhere on the western mesa. Other associations include dense scrub dominated primarily by Salvia mellifera on south-facing upper slopes of divides to the east of Purisima Canyon, and dense scrub dominated by many shrub species (e.g., Artemisia californica, Baccharis pilularis, Encelia californica, Ericameria ericoides, Mimulus aurantiacus, Rhamnus spp., Salvia mellifera, and Senecio douglasii) on upper slopes and crests of south-facing slopes of the western mesa. Species lists for several areas (e.g. Localities 3 & 20) have been prepared (Appendix V).

Dominants of Central Coastal Scrub also vary significantly depending on the degree of disturbance of an area. For example, previously cultivated or disturbed slopes along the margins of Purisima Canyon, particularly the eastern side, are characterized by scattered plants of Baccharis pilularis in Cismontane Introduced Grasses (Fig. 14). Lupinus arboreus occurs occasionally at these sites. Upper portions of these same slopes usually are more densely vegetated with both Central Coastal Scrub and Mixed Chaparral. In turn these communities are often followed by Coast Live Oak Forest on north-facing slopes that rise above the disturbed sites. Other disturbed areas include portions of the western mesa containing dominants of Central Coastal Scrub, chaparral and Southern Coastal Oak Woodland (Fig. 7). The vegetation of such disturbed areas will be covered in another section of this report (see: The Effects of Disturbance on the Vegetation).

In addition to the occurrence of Central Coastal Scrub species in disturbed areas, there also are numerous examples where intermixing of species occurs in transition to other communities. Perhaps the best

Fig. 13. Central Coastal Scrub: View from margin of eastern road in Purisima Canyon northeast of Lower Reservoir, eastward up ridge on the dissected foothill slope. Dominant shrubs include Artemisia californica, Baccharis pilularis, Ericameria ericoides, Eriophyllum confertiflorum, and Rhamnus californica. Cismontane Introduced Grasses occur on the lower slope and Southern Coastal Oak Woodland and Chaparral occurs on the upper slope and crest of the ridge. A naturalized cactus, Opuntia ficus-indica (left), is occasional at this site.

Fig. 14. Central Coastal Scrub and Cismontane Introduced Grasses: View from margin of eastern road in Purisima Canyon, southeastward to cross on crest of foothill slope. This previously cultivated/grazed field is in a successional phase from Cismontane Introduced Grasses to Central Coastal Scrub, dominated by Baccharis pilularis. Lupinus arboreus also is common here, suggesting that elements of dune scrub are also present in this phase of succession. Coast Live Oak Forest (background) occurs on the north-facing slope.



example of this occurs on the western mesa just west of the park staff residences (Fig. 7). Northern Coastal Dune Scrub dominates the loose sandy soil of a broad, shallow basin. North and northwest on a low-grade, northwest-rising slope this community is transitional to Central Coastal Scrub, which in turn is transitional to and mixed with chaparral and Southern Coastal Oak Woodland communities that dominate the plateau on the mesa.

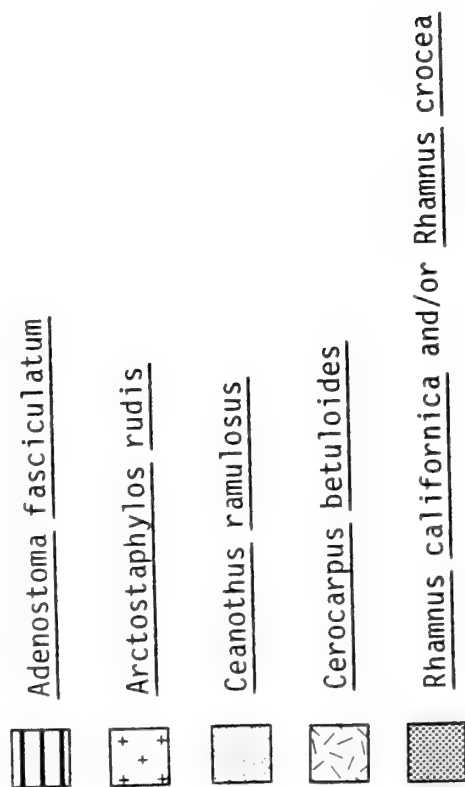
In contrast to the transitional nature of some examples, other margins of Central Coastal Scrub are characterized by abrupt changes. At one particular example, the vicinity of Locality 26 (Appendix IV), a slope dominated by Salvia mellifera terminates at its downslope limit with a narrow "bare zone." Here virtually no shrubs occur and only scattered herbaceous species grow. Northern Coastal Dune Scrub and grassland occur adjacent to this zone. Such patterning of vegetation has been attributed to the inhibitory effects of volatile compounds leached from plants such as S. mellifera. First described by Muller et al. (1964), the history of investigation into this process has been summarized for Southern Coastal Scrub by Mooney (1977), who includes much of Central Coastal Scrub within this broader category.

CHAPARRAL - Chaparral vegetation at the Park occurs in two major forms, California Mixed Chaparral and Chamise Chaparral. Both of these forms occur predominantly on the plateau and upper slopes of the western mesa, and on crests of ridges and upper slopes east of Purisima Canyon (Fig. 7). Tall, dense vegetation often is characteristic on Orcutt sand. Smaller, scattered dominants of Mixed Chaparral often occur at disturbed sites, such as wind-blown, south-facing margins of the western mesa, and areas where vegetation has been removed or burned.

Species characteristic of both forms of chaparral are listed in the Classification of Upland Vegetation (Appendix I). The occurrence of several dominant species is illustrated in Fig. 15. Although dominants vary depending on soil type, slope, and disturbance, Adenostoma fasciculatum is the most characteristic species of chaparral vegetation at the Park. This suggests that much of the vegetation can be classified as Chamise Chaparral. Arctostaphylos purissima, A. rudis, and Ceanothus ramulosus are common associates in both types of chaparral. Additional dominants of California Mixed Chaparral include Cercocarpus betuloides, Helianthemum scoparium, Heteromeles arbutifolia, Leptodactylon californicum, Mimulus aurantiacus, Rhamnus californica, R. crocea, and Toxicodendron diversilobum (Fig. 16).

Obvious correlations between the distributional patterns of chaparral dominants and variations in the physical environment provide some insight into the factors influencing the composition of this vegetation. For example, Chamise Chaparral (Fig. 17) usually occurs on the hardest soils of mesa flats or upper slopes and is developed best in areas where there has been little recent disturbance. However, exposures of Orcutt Sand with rather sterile, disturbed soil usually are dominated by Arctostaphylos purissima and A. rudis, forming patches of Arctostaphylos Chaparral. In contrast to this type of disturbed habitat, margins of roads or paths in Chamise Chaparral support a greater diversity of species (e.g., Artemisia californica, Baccharis pilularis, Ceanothus impressus, Mimulus aurantiacus, and Leptodactylon californicum). Yet another variation includes shallow drainage troughs in terrain of Chamise Chaparral. These troughs often lack Adenostoma fasciculatum (Fig. 15), and instead are dominated by Ceanothus ramulosus.

FIGURE 15. DOMINANTS OF CHAPARRAL VEGETATION



The general occurrence of Chaparral vegetation is illustrated in Figure 7. The distribution of selected shrubs occurring as dominants in Chamise Chaparral and Mixed Chaparral is illustrated below. Symbols that lack a line marking their boundary represent either a transitional area in the distribution of a dominant species or areas in which the boundary could not be determined. The distribution of additional species (e.g., Salvia mellifera and Mimulus aurantiacus) of Mixed Chaparral that also are characteristic species of Central Coastal Scrub is illustrated in Figure 7.

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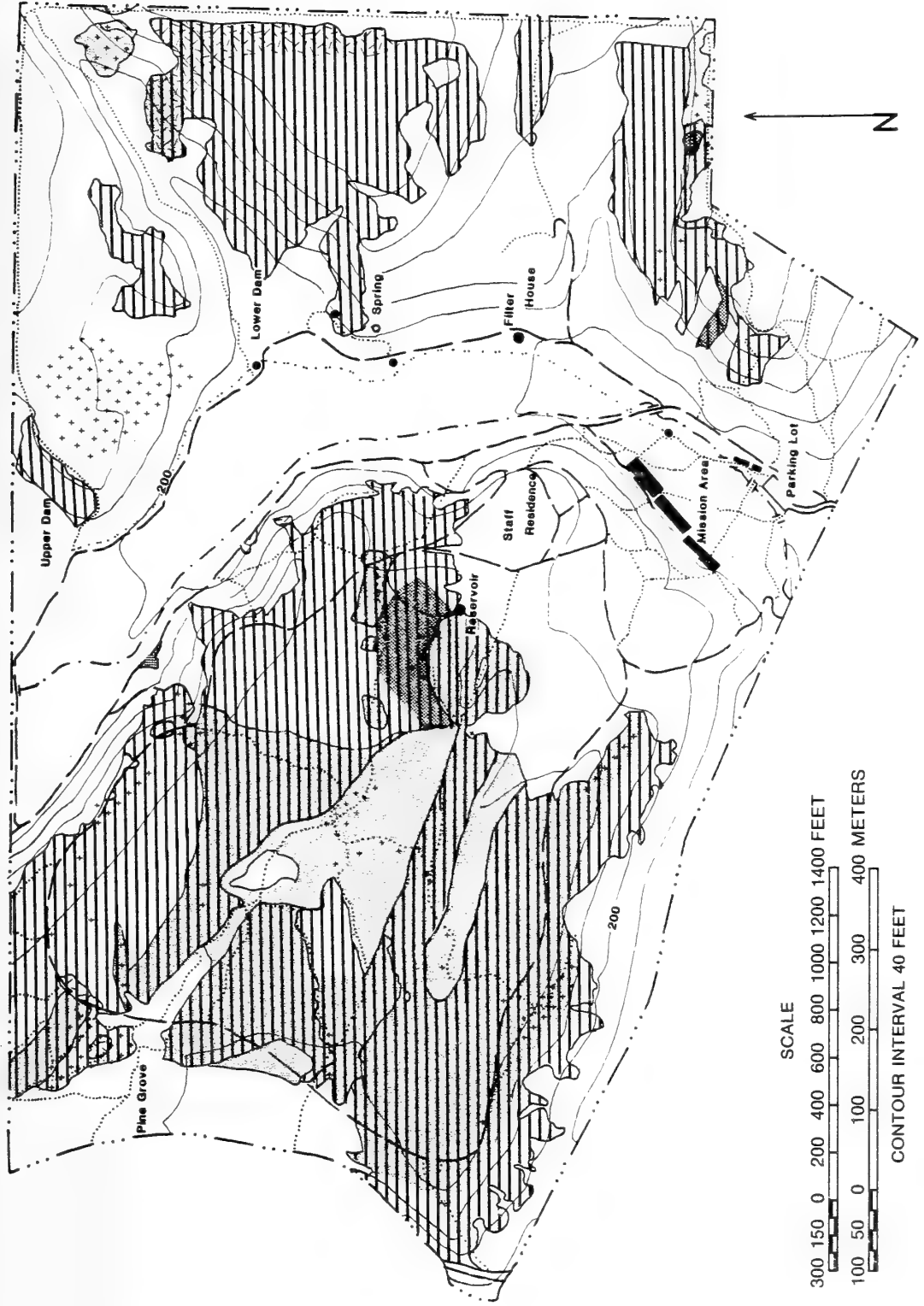


Fig. 16. Mixed Chaparral: View from vicinity of southern limit of Burton Mesa, northward up exposed slope of sand "blow out" area toward service road. Chaparral dominants include many shrubs, for example Adenostoma fasciculatum, Arctostaphylos rudis, Eriophyllum confertiflorum, Leptodactylon californicum, Lotus scoparius, Mimulus aurantiacus, and Toxicodendron diversilobum. Additional perennial species include Horkelia cuneata, Cardionema ramosissima, Croton californicus, Dudleya lanceolata, Melica imperfecta, and Poa scabrella. Among the numerous annual species occurring on the open sand are Crassula erecta, Cryptantha clevelandii, Eriophyllum multicaule, Lotus strigosus, and Mimulus bevipres.

Fig. 17. Chaparral: View from vicinity of service road westward to Eucalyptus trees on west side of Rucker Road. Dominants include Adenostoma fasciculatum (foreground), Artemisia californica (right-center), Cenaothus ramulosus (upper-right), and Quercus agrifolia (upper left). Additional shrubs found nearby include Arctostaphylos purissima, and A. rudis. Cultivated trees from the pine plantation are located in the left and right background. This example of chaparral resembles the Chamise Chaparral of other areas of the Park, but has some species more characteristic of Mixed Chaparral, Southern Oak Woodland, and Central Coastal Scrub.



Other sites with moister conditions, such as more northerly-facing slopes, often support Mixed Chaparral. Areas where chaparral vegetation has been removed without scrapping the soil usually have a greater abundance of Ceanothus ramulosus, even though A. fasciculatum dominated the site previously and still occurs adjacent to it. Ceanothus Chaparral is apparently successional to Chamise Chaparral in this region. Fire also has had a major impact on the vegetation. The relationship between disturbance and the plant communities at the Park will be discussed in further detail in another section of this report (see: The Effects of Disturbance on the Vegetation).

The relationship between chaparral vegetation and adjacent communities also is complex and reflects not only the long history of disturbance at some sites within the Park but also the intermediate nature of some habitats. The most obvious overlapping of community dominants is represented by the frequency of oaks (Quercus agrifolia) mixed with chaparral and Central Coastal Scrub species (Fig. 7). The resulting vegetation has been called Woodland Chaparral (Hanes, 1977). At the Park a majority of oaks in this setting have multiple trunks and probably reflect crown-sprouting from trees burned during fires.

GRASSLANDS - Grassland as a mapped unit of the landscape, excluding cultivated fields, is of minor importance at the Park (Fig. 7). It occurs on flats and slopes and is associated most often with excessively-drained, loose sandy soils of the Arnold and Marina Series.

Species characteristic of Cismontane Introduced Grasses and Cismontane Native Grassland are listed in the Classification of Upland Vegetation (Appendix I). Cismontane Introduced Grasses is the most widespread form of grassland vegetation and occurs most commonly in three

situations: 1) as open grassland of largely annual species in disturbed areas, often where woody vegetation has been removed and where cultivation/grazing has occurred; 2) in stable, open scrub communities such as Northern Coastal Dune Scrub; and 3) as a successional predecessor to scrub communities, and hence mixed with species of various communities in transitional phases. In addition to various naturalized grasses (e.g., Avena spp., Bromus spp., Schismus barbatus, and Vulpia spp.) and other naturalized genera such as Erodium, numerous species of native wild flowers are also characteristic (Fig. 18). Species lists for several localities have been prepared (Appendix V) and illustrate the diversity of this flora. Of particular note are the grassland associated with dune scrub of Locality 1 (Fig. 12) and the open grassland of Locality 17 (Fig. 18). A profusion of wild flowers occurs during years of ample winter and early spring rains. In the dune scrub community representative genera include the following: Amsinckia, Camissonia, Chorizanthe, Cordylanthus, Cryptantha, Eriastrum, Eriogonum, Eriophyllum, Erysimum, Filago, Gilia, Gnaphalium, Heterotheca, Horkelia, Layia, Lessingia, Linaria, Lotus, Lupinus, Navarretia, Orthocarpus, Phacelia, and Salvia. Additional genera at Locality 17 include Collinsia, Delphinium, and Meconella; while at other sites Microseris, Mimulus and Senecio are found. Occasional native perennial grasses such as Melica imperfecta and Koeleria macrantha occur with these herbaceous species when associated with scrub communities.

Cismontane Native Grassland is represented only marginally and occurs more as scattered individuals characteristic of the community than as a mapped unit. For example, patches of Stipa cernua occur at the southern edge of the western mesa (e.g., Lookout Point) and patches of

Stipa lepidula occur in openings of chaparral and oak woodland vegetation of the southwest-facing slope of this mesa. Stipa cernua also has been found growing in a disturbed area colonized largely by Cismontane Introduced Grasses (Fig. 19).

Other forms of Cismontane Native Grassland are associated with Southern Coastal Oak Woodland and Coast Live Oak Forest. Bromus carinatus often is dominant in the understory of these communities and can be associated with Claytonia perfoliata and Stachys bullata in addition to other native herbaceous species. In other examples many naturalized plants occur with Bromus carinatus, including Bromus diandrus and Sonchus oleraceus, among others. Another association can be found on the northeast-facing slope of the western mesa along the road and below Coast Live Oak Forest vegetation. The shaded, abruptly-rising lower slope is characterized by many native herbaceous species including the following: Clarkia spp., Collinsia heterophylla, Delphinium parryi, Layia paniculata, Meconella linearis, Melica imperfecta, Orthocarpus purpurascens, and Poa bulbosa. Under less shaded, more disturbed conditions this association would probably include many naturalized plants and hence would be classified as Cismontane Introduced Grasses. Additional associations of grassland species in habitats that are currently cultivated will be discussed at the end of this section on upland vegetation.

SOUTHERN COASTAL OAK WOODLAND - Oak woodland vegetation in this area is widespread and occurs both as a mapped unit and as a form (Woodland Chaparral) mixed with scrub communities such as Central Coastal Scrub, and/or Chamise or Mixed Chaparral (Fig. 7). It also grades to Coast Live Oak Forest which can be distinguished from oak woodland by a largely

closed canopy. At the Park, Southern Coastal Oak Woodland occurs on the mesa, ridge-crests, and slopes. Although it is found on both north- and south-facing slopes, Coast Live Oak Forest is usually characteristic of the more northerly-facing slopes. Oak woodland vegetation occurs on both the Marina and Arnold sands.

As scattered trees of Quercus agrifolia (Coast Live Oak), Southern Coastal Oak Woodland characterizes south-facing slopes and some non-wetland bottomlands and flats, and is usually associated with Cismontane Introduced Grasses or a form of Central Coastal Scrub with scattered shrubs among numerous herbaceous species (Fig. 7). As dense Woodland Chaparral, it usually occurs on the mesa plateau, crests of ridges, or northeast-facing slopes. Here it is typically associated with Heteromeles arbutifolia, Rhamnus californica, Sambucus mexicana, Toxicodendron diversilobum, and shrubs restricted more often to scrub or chaparral vegetation, such as Arctostaphylos spp., Artemisia californica, Ceanothus ramulosus, Ericameria ericoides, and Mimulus aurantiacus.

The forms of the oak trees in the various types of oak woodland reveal environmental factors that influence vegetation. For example, oak woodland of south-facing slopes is composed of individual trees usually with single trunks. However, Woodland Chaparral is characterized by oaks with multiple trunks, a phenomenon that may reflect the fire history of the vegetation. Trunks of oak trees severely burned during a chaparral fire will die back and new sprouts often appear from the bases of the old trees. On the western mesa trees with as many as six trunks are common.

COAST LIVE OAK FOREST - This community differs from Southern Coastal Oak Woodland by having a closed rather than an open canopy (i.e., the canopies of individual trees are touching or overlapping rather than

Fig. 18. Cismontane Introduced Grasses: View from east-facing slope of Burton Mesa, southeastward over floor of Purisima Canyon to foothills of the Purisima Hills. Grassland is dominated by introduced annual grasses such as Bromus diandrus, B. mollis, B. rubens and Vulpia myuros var. hirsuta, and by numerous native species. These include some perennials, such as Croton californicus, Heterotheca grandiflora, and numerous annuals, such as Amsinckia spectabilis, Camissonia micrantha, Collinsia bartsiaefolia, Eriastrum densifolium, Layia glandulosa, Lupinus bicolor, L. truncatus, Meconella linearis, Orthocarpus purpurascens, Phacelia douglasii, Cryptantha clevelandii, Pterostegia drymarioides, and Thysanocarpus curvipes.

Fig. 19. Cismontane Mixed Grassland: View from margin of pine grove, eastward across area where vegetation was removed. Cismontane Introduced Grasses (foreground), dominated by Erodium spp., are transitional to mixed grassland with elements (e.g., Stipa cernua) of Cismontane Native Grassland. Chamise Chaparral mixed with Quercus agrifolia (background) apparently dominated the site previously. Introduced pines have naturalized in a disturbed area (background).



having gaps between them). Coast Live Oak Forest is usually confined to north- or northeast-facing slopes (Fig. 7), both of which are characterized by soils of the Marina or Arnold Series.

Several good examples of oak forest vegetation occur on the western side of Purisima Canyon (Fig. 20) and on slopes of ravines that dissect the eastern slope of the Park. The community is dominated by Quercus agrifolia and may include several characteristic shrubs such as Heteromeles arbutifolia, Rhamnus californica, Rubus ursinus, Sambucus mexicana, Symphoricarpos mollis, and Toxicodendron diversilobum. Occasional openings in the canopy may permit enough light to penetrate to the understory, supporting shrubs such as Arctostaphylos rudis, Ceanothus ramulosus, Ericameria ericoides, and Keckiella cordifolia. Characteristic herbaceous species of the oak forest community include Bromus carinatus, Claytonia perfoliata, and Dryopteris arguta.

At the base of some north-facing slopes, Coast Live Oak Forest is often transitional to wetland vegetation (Fig. 21). In addition to Quercus agrifolia, trees of the area can include Salix laevigata and S. lasiolepis. Dominants of Emergent Wetlands (e.g., Carex spp., and Juncus spp.) also occur in the transitional vegetation.

VEGETATION OF RECENTLY DISTURBED HABITATS - A group of miscellaneous upland habitats, all of which have received recent or continued disturbance, support various associations of species which collectively or individually do not fit well into other categories of the classification scheme. These habitats usually are characterized by naturalized species.

Firebreaks, roads, and paths have open sandy substrates. Firebreaks with loose sand tend to be colonized by iceplants (e.g., Carpobrotus

edulis and C. edulis x C. aequilaterus), while those with more compact soils may be colonized by elements of Cismontane Introduced Grasses (e.g., Erodium botrys). Service roads on the western mesa include at least two subhabitats: 1) beds with compacted sand, characterized by Spergularia bocconii, S. villosa, and others; 2) margins with loose sand, characterized by the grasses Koeleria phleoides and Schismus barbatus in addition to other naturalized species such as Cotula australis, Filago gallica, Lepidium virginicum, and various native species (e.g., Filago californica, Navarretia atractyloides, Sagina occidentalis, and Stylocline gnaphalioides). Paths are often colonized by the same species that occur along road margins, but frequently include more native species if they cut through open native vegetation like dune scrub rather than dense vegetation like Chamise Chaparral.

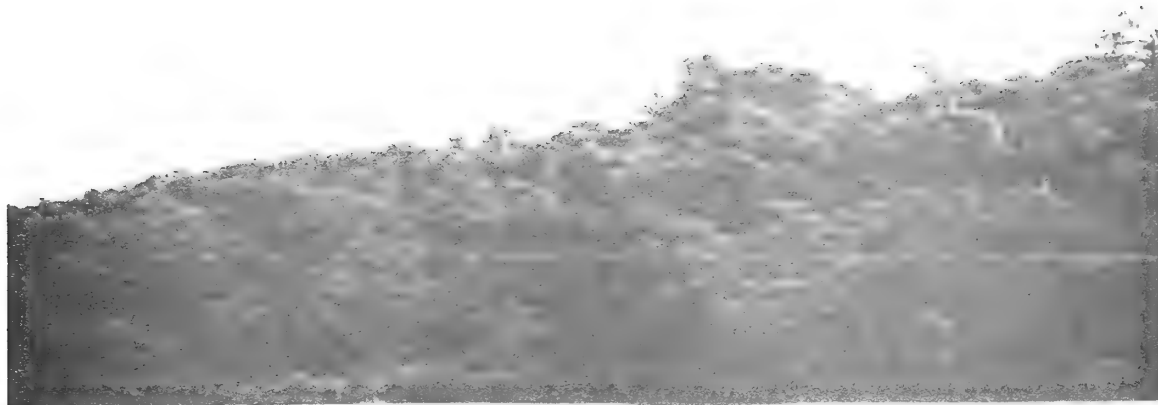
The Mission and residence grounds support numerous weedy species, a checklist of which is provided in Appendix IV (Locality 15). In some of the sandier disturbed areas various natives also grow, such as Croton californicus and Eschscholzia californica.

The bottomlands of Purisima Canyon are cultivated with Hordeum vulgare var. vulgare (Barley), H. vulgare var. trifurcatum (Beardless Barley), and Triticum aestivum (Wheat). However, throughout much of the field Raphanus raphanistrum is common to abundant. Margins of the field often include many naturalized species, such as Brassica geniculata, B. rapa, Sonchus asper, S. oleraceus, Spergula arvensis, Vicia sativa, and others.

Wetland Vegetation - Vegetation of wetlands (Fig. 7) was classified (Appendix II) according to Cowardin et al. (1979), and consists of two systems (Riverine and Palustrine) that contain 5 major classes, namely

Fig. 20. Coast Live Oak Forest: View from floor of Purisima Canyon (cultivated field), southwestward to northeast-facing slope of Burton Mesa. This community is dominated by Quercus agrifolia, but supports many characteristic species. For example, shrubs are represented by Keckiella cordifolia, Heteromeles arbutifolia, Rubus ursinus, Sambucus mexicana, and Toxicodendron diversilobum; herbaceous plants by ferns (e.g., Dryopteris arguta), native grasses (e.g., Bromus carinatus) and annuals (e.g., Claytonia perfoliata and Layia paniculata). Openings in the canopy often provide enough light to support areas of Central Coastal Scrub, chaparral, and grassland.

Fig. 21. Coast Live Oak Forest: View down path, westward along creek (right) through partially shaded woodland community toward Upper Reservoir. Quercus agrifolia dominates the north-facing slope. Understory includes Rubus ursinus, Symphoricarpos mollis, and Toxicodendron diversilobum. Numerous herbaceous species occur in open areas and along paths. Palustrine Wetlands (right) occur adjacent to the Coast Live Oak Forest, the downslope portion of which is transitional to wetland communities.



Streambed, Aquatic Bed, Emergent Wetland, Scrub/Shrub Wetland, and Forested Wetland. The two systems are defined in Appendix II, and the classes are described below in the order in which they appear in this classification.

STREAMBED - The Riverine System of wetlands is represented in lower Purisima Canyon only by the streambed habitat of intermittent Los Berros Creek. This wetland is mostly nonvegetated but nonpersistent emergent plants (those that die back and the above ground material of which is transported downstream) do occasionally occur and may include Epilobium adenocaulon and Oenothera hookeri. Rorippa nasturtium-aquaticum (Water Cress), a species common to perennial streams, was not located here even though Los Berros Creek is named after that plant. It probably occurs in streambeds of canyons at higher elevations or at seeps similar to those in the Park. However, it could have been eliminated by the extensive flooding that occurred during the Winter of 1983.

AQUATIC BED - The Palustrine System of wetlands is represented by several classes of vegetation and numerous associations of characteristic species dependent upon water regimes, substrates, and habitats. The class Aquatic Bed includes wetlands and deepwater habitats dominated by plants that grow on or below the surface of water and includes subclasses Floating and Rooted Vascular. At the Park only the floating-vascular type occurs. It is represented by two species (Azolla filiculoides and Lemna minima) that float on the surface of water in the reservoirs and along the aqueduct or in at least one cistern, and a third species (Wolffiella lingulata) that floats immediately beneath the surface of the water in the Upper Reservoir. Our collections of W. lingulata may be the only record of this species for Santa Barbara County.

EMERGENT WETLAND - The class Emergent Wetland is widespread and is represented by diverse associations of dominant species. This wetland type is characterized by erect, rooted, herbaceous hydrophytes, many of which are perennial species. Most of these wetlands at the Park belong to subclass Persistent, having dominant species that remain standing until the next growing season.

Characteristic species of this community are listed in Appendix II. Water regime is of particular importance in determining plant associations. For example, habitats that are usually permanently or semipermanently flooded or occasionally seasonally flooded support plants that are less tolerant of desiccated substrates. The margins of open water of the Upper Reservoir (Fig. 22) are colonized by Scirpus acutus, S. microcarpus, Sparganium eurycarpum, and Typha latifolia. Alternatively, the largely permanently flooded to saturated streambed above this reservoir supports a somewhat different association including Carex spp., Juncus spp., Oenanthe sarmentosa, Psoralea orbicularis, and Scirpus microcarpus. In contrast to these associations, the seasonally or temporarily flooded margins are characterized by species more tolerant of desiccated substrates (e.g., Carex praegracilis) and also include many upland species. In addition, species from more regularly flooded habitats that occur in the lower portions of these transitional areas also occur here.

Similar associations occur at the Lower Reservoir (Fig. 23). No open water occurs at this site today because the body of the reservoir has been colonized by Scirpus acutus. Additional species (Polygonum amphibium and Sparganium eurycarpum) occur along the margin. Other associations occur above and below the reservoir. For example, in the

Fig. 22. Palustrine Wetlands: View from dam of Upper Reservoir, north-eastward to vegetated wetlands at head of reservoir. Emergent Wetlands (center) are dominated by Scirpus acutus (left) and Typha latifolia (right). Forested wetlands (upper left and center) are dominated by Salix laevigata and S. lasiolepis. Coast Live Oak Forest (upper right) on upland adjacent to the various wetlands is dominated by Quercus agrifolia.

Fig. 23. Palustrine Wetlands: View from upland on south side of Lower Reservoir, northeastward across reservoir to divide separating Upper and Lower Reservoirs. Palustrine Emergent Wetlands, dominated primarily by Scirpus acutus, have covered the reservoir. Palustrine Scrub/Shrub Wetlands, dominated by Salix lasiolepis and Baccharis pilularis, occur along the margins of the reservoir. Elements of Palustrine Forested Wetlands, for example Quercus agrifolia and Salix lasiolepis, occur scattered on the margins and up canyon (right) on the seasonally wet bottomlands. Central Coastal Scrub occurs on the south-facing slope in the background, and at the base of the north-facing slope in the foreground.



saturated or seasonally flooded wetland below the dam, numerous species, including Eleocharis palustris, Elymus triticoides, Juncus spp., and Sparganium eurycarpum, have colonized flats. A dirt road occurs adjacent to this area and contains seasonally flooded, disturbed wetland, with silty substrates that are dominated by Distichlis spicata, Gnaphalium luteo-album, Hordeum geniculatum, Juncus bufonius, Lythrum hyssopifolia, Polypogon monspeliensis, and others. In contrast, the seasonally or temporarily flooded Emergent Wetlands above the reservoir occur along bottomlands of a canyon and adjacent to Forested or Scrub/Shrub Wetland and upland habitats. The sandy substrates support a diverse mixture of wetland, transitional and upland species, some of which are restricted to the area, such as Muhlenbergia rigens, and others typically dominant in scattered locations, such as Carex praegracilis, Distichlis spicata, and Juncus textilis. Checklists for the Upper (Locality 19) and Lower (Locality 28) Reservoirs and vicinities are located in Appendix IV.

Seeps are another important habitat for Emergent Wetlands and occur primarily along the eastern margin of Purisima Canyon. In open conditions without shading by Forested or Scrub/Shrub Wetland species, there is a high diversity of species. Seeps may be transitional to wet areas associated with the aqueduct or with disturbed wetlands in roads, both of which provide habitats for additional species. One such site (Locality 27, Appendix IV) supports dense vegetation at the seep (e.g., Artemisia douglasiana, Carex barbarae, Juncus effusus, J. textilis, Oenanthe sarmentosa, Psoralea orbicularis, Scirpus microcarpus, Solidago spp., and others), scattered vegetation of large and small species along margins of the aqueduct (e.g., Epilobium adenocaulon, Gnaphalium luteo-album, Mimulus guttatus, Oenothera hookeri, Samolus parviflorus, and Scirpus

cernuus), a grass/rush/sedge association along the road margin (e.g., Carex spp., Juncus spp., Lolium perenne, Polypogon monspeliensis and scattered broad-leaved species), and a disturbed, wet substrate flora in the roadbed similar to that described previously. These examples illustrate the relationship between the water regime, substrate, and other characteristics of the habitat, as well as demonstrate the diverse and floristically rich Emergent Wetlands at the Park.

SCRUB/SHRUB WETLAND - The class Scrub/Shrub Wetland is characterized by woody vegetation less than 6 meters (20 feet) tall. Plants include true shrubs, young trees, and trees or shrubs that are stunted because of environmental conditions. Emergent Wetlands are often successional to Scrub/Shrub Wetlands, which in turn are frequently transitional to Forested Wetlands.

This vegetation occurs as several distinct types at the Park, each type usually corresponding to specific habitats. For example, along margins of Forested Wetlands, seeps, and streambeds in canyons, a number of shrubs occur together as a wetland thicket (Appendix II). The trough of the canyon bottomlands is often adjacent to this association and usually is dominated by Salix lasiolepis, as either a shrub or tree. A temporarily flooded, less dense wetland that is often transitional between the thicket and upland vegetation also includes a number of taxa, many of which are characteristic of upland scrub vegetation (Appendix II).

Another type of Scrub/Shrub Wetland is found in disturbed areas or in the lower limits of canyon mouths. It may be vegetated by Baccharis pilularis, a colonizer of moist, disturbed habitats; or, if wet enough, also by other shrubs such as Salix lasiolepis. Both of these species

grow along the more recently vegetated margin of the Lower Reservoir (Fig. 23).

FORESTED WETLANDS - The class Forested Wetland is characterized by woody vegetation that is 6 meters tall or taller. It occurs in four habitats at the Park, but is dominated commonly by only a few species. The riparian vegetation of Los Berros Creek (Fig. 24) consists of Scrub/Shrub vegetation that is transitional to Forested Wetland. Most of this vegetation has grown since 1938. The dominant species is Salix lasiolepis.

Forested Wetlands also are associated with seeps. The most well-developed example occurs on the eastern slope of Purisima Canyon (Fig. 24) and is dominated by Populus trichocarpa. A small stand of Coast Live Oak Forest, more characteristic of north-facing slopes in this region, has established on the mesic soils.

Margins of reservoirs are suitable habitats for Forested Wetland. At the head of the Upper Reservoir are seasonally flooded and permanently saturated flats, that may have resulted from the gradual accumulation of sediment in the reservoir. The dominant trees are Salix laevigata and S. lasiolepis, and Quercus agrifolia occurs along the outer margins (Fig. 22). The upstream and western portions of the site occur along a stream which runs partially through the Forested Wetland during peak seasonal flows (Fig. 25).

Additional Forested Wetlands occur in bottomlands of the canyon above the Lower Reservoir. This vegetation has increased in cover during the past 40 years. Salix lasiolepis dominates the vegetation, although scattered individuals of Quercus agrifolia and Populus trichocarpa also occur.

The Effects of Disturbance on the Vegetation - La Purisima Mission State Historic Park provides an excellent opportunity to describe the succession of vegetation in disturbed habitats for several reasons: 1) different plant associations occur on similar substrates and are adjacent to each other; 2) many areas and plant communities have received at least one form of disturbance during the past 45 years, while other areas have not; 3) some of the disturbed areas have not received additional disturbance after the initial impacts, while others have received repeated disturbances; 4) much of the history of disturbance has been recorded by aerial photography starting in 1938; and 5) the current flora and vegetation of the site have been documented. These factors have permitted us to summarize successional trends for selected areas (Fig. 26) based on the descriptive information and photographic record (see: Land Use Map, Fig. 6). Aerial photographs used in this analysis were supplied by the UCSB Map and Imagery Lab and include the following: 1) C-5140-19, 1938; 2) BTM-2K-139, 2-21-1954; 3) BTM-10K-5, 4-9-1954; BTM-5BB-101, 0-24-61; 4) BTM-2HH-31, 5-14-1967; 5) PW4742-6, 11-24-1974.

AREA 1 - This portion of the western mesa is characterized by dense Chamise Chaparral. Aerial photographs reveal that the area apparently has not received any disturbance in the form of vegetation removal or burning for more than 45 years.

AREA 2 - Similar to Area 1 until at least 1967, Area 2 apparently had been burned by an arson fire and surrounded by a firebreak before November, 1974. The vegetation now is characterized by both Central Coastal Scrub and Mixed Chaparral dominants and consists of shrubs scattered among sparse herbaceous vegetation.

Fig. 24. Palustrine Forested Wetlands: View from slope of western mesa eastward across Purisima Canyon to eastern slope. Forested Wetlands along Los Berros Creek are dominated by Salix lasiolepis but also include Platanus racemosa, Populus trichocarpa, Salix laevigata and S. lasiandra. Forested Wetlands associated with a seep (center) along the west-facing slope in the background are dominated by Populus trichocarpa, Quercus agrifolia and Salix lasiolepis.

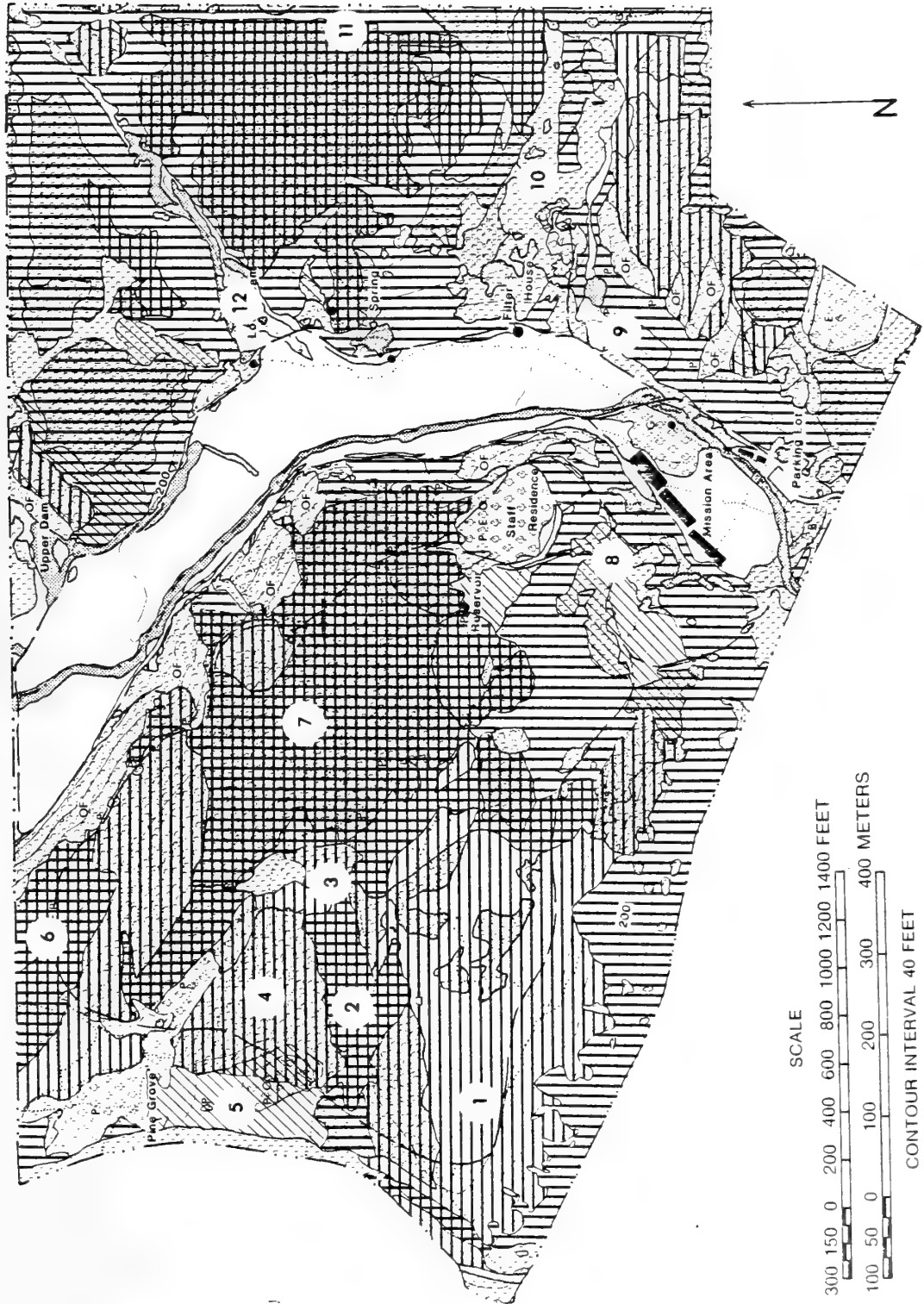
Fig. 25. Palustrine Forested Wetlands: View from streambed above (east) of Upper Reservoir, northward into a Palustrine Forested Wetland that occurs adjacent to stream and what remains of the reservoir. Dominant trees include Salix laevigata and S. lasiolepis. Occasional individuals of Quercus agrifolia occur transitionally between the Forested Wetland and Coast Live Oak Forest and Southern Coastal Oak Woodland. Palustrine Emergent Wetlands in the streambed and along the outer margin of Forested Wetland include Woodwardia fimbriata (center), Carex barbarae, Oenanthe sarmentosa, and Scirpus microcarpus (foreground). Scrub/Shrub Wetland is represented on stream banks by Rubus ursinus.



FIGURE 26. EFFECTS OF DISTURBANCE ON VEGETATION: SELECTED AREAS*

- AREA 1 No obvious disturbance since 1938
- AREA 2 Firebreak and controlled burning prior to 1974
- AREA 3 Vegetation cleared prior to 1938, portions burned prior to 1961 and again prior to 1967
- AREA 4 Portions disturbed prior to 1938; burned between 1954 and 1961
- AREA 5 Vegetation removed prior to 1938; plantation evident by 1954
- AREA 6 Vegetation removed after 1938; burned prior to November 1974
- AREA 7 No obvious disturbance since 1938
- AREA 8 No major disturbance since 1938
- AREA 9 Vegetation removed prior to 1938 and area cultivated into early 1940's; by 1954 vegetation was recovering
- AREA 10 Cultivated prior to and during 1938; by 1954 vegetation was recovering
- AREA 11 Firebreak constructed prior to 1954; vegetation was recovering by 1967
- AREA 12 Lower Reservoir dates from early 19th century; by 1938 Emergent Wetland vegetation invaded portions of wetland habitat; by 1954 some shrubs and trees occurred

*Refer to Fig. 7 for an explanation of shading. Boundaries of plant communities at the selected areas usually correspond to limits of various types of disturbance.



AREA 3 - One of the most repeatedly disturbed portions of the western mesa, Area 3 had been cleared of vegetation prior to 1938. Although scattered shrubs had returned by April, 1954, portions of the area had been burned prior to 1961. Furthermore, prior to June, 1967 another burn included the entire site. Today the vegetation is characterized by Cismontane Introduced Grasses and scattered dominants of Central Coastal Scrub. The grassland nature of this area may not be due entirely to disturbance, however, because the grassland area just north of the site appeared virtually the same in 1945 as it does today. A local occurrence of Arnold Sand (Fig. 5) also has been mapped here.

AREA 4 - This site appeared in 1938 as mixed vegetation composed of Chamise Chaparral and scattered oaks, although at least a portion of the area was disturbed prior to 1938 and had revegetated to a less dense scrub community. This area was quite similar to Area 1 by 1954, but prior to June, 1961 it had been burned and almost entirely surrounded by a firebreak. This resulted in the loss of most of the scrub vegetation. By May, 1967 the area had recovered to as much as one half the density of cover it had previously. By November, 1974 the impact of the disturbance was hardly recognizable in an aerial photograph and today the vegetation is virtually indistinguishable from that of most of Area 1.

AREA 5 - Vegetation was removed from Area 5 prior to 1938; however, the scattered oaks occurring here today apparently had not been planted here by this date, nor had the pine plantation which occurs in the northern portion of this disturbed area. These plantings are evident in a February, 1954 photograph, as are both grassland and scrub vegetation. These same communities exist in Area 5 today, and although Chamise Chaparral and oak woodland communities occur adjacent to and east of this

disturbed site, succession to these communities is not immediately evident from photographs after at least 30 years of no apparent disturbance. However, scattered shrubs of Ceanothus ramulosus do occur here, particularly on the eastern margin of the area, and suggest some reversion to chaparral vegetation.

AREA 6 - Area 6 appeared as an open scrub/oak woodland community in 1938 but apparently had been cleared of vegetation shortly thereafter, and by 1954 was characterized by a dense scrub cover. The vegetation was burned and surrounded by a firebreak by November of 1974. As a result of this fire, the area appeared to have few remaining shrubs and contained scattered oaks. By 1981 (Fig. 7) the site had recovered to Central Coastal Scrub, but the majority of oaks apparently did not survive the fire.

AREA 7 - This extensive example of Woodland Chaparral has not received any obvious extensive disturbance in the past 45 years. Aerial photographs from 1938 to 1981 illustrate a very similar community structure and density, including some open substrate areas appearing as northwest/southeast trending striations that paralleled the strike of the adjacent ridges. Many of the scattered oaks of the community have multiple trunks, suggesting that fire has had an important impact on the area in the past.

AREA 8 - The Northern Coastal Dune Scrub of this area has occurred similar to its present form since at least 1938. The flats of this low profile basin are covered with a loose sandy soil, the sediments of which were probably derived from erosion of the adjacent mesa plateau. This community appears to be stable under these conditions, and may not be successional to Central Coastal Scrub or Mixed Chaparral, both of which

occur nearby and with which the dune scrub is transitional. However, better resolution of aerial photographs might reveal encroachment of Central Coastal Scrub from the north down a gentle slope and into the area covered by Northern Coastal Dune Scrub. The general stability of this dune scrub vegetation suggests that the soil map for the Park (Fig. 5) may be inaccurate in showing that the same phase of the Marina Series occurs over much of the western mesa.

AREA 9 - Vegetation was removed from this site prior to 1938 and cultivation of crops probably occurred here until some time in the 1940's. By April, 1954, it appeared to have been covered by Cismontane Introduced Grasses and scattered small shrubs. The area has remained undisturbed during the past 40 years. During this time Central Coastal Scrub vegetation has gradually invaded the site from the slopes to the east. Today the lower portions are characterized by Cismontane Introduced Grasses with scattered plants of Baccharis pilularis and Lupinus arboreus, the first phase of succession to Central Coastal Scrub.

AREA 10 - The south-facing slope of the Filterhouse Canyon was apparently cultivated prior to and during 1938 (Fig. 6). After cultivation ceased, Cismontane Introduced Grasses and scattered shrubs of the Central Coastal Scrub type had vegetated the area by 1954. Invasion of the site by Central Coastal Scrub continues after about 40 years of abandonment.

AREA 11 - Much of the Park was surrounded by a firebreak prior to 1954. A 1938 aerial photograph reveals that the Woodland Chaparral adjacent to the firebreak continued eastward and covered this site. Following removal of all vegetation, Cismontane Introduced Grasses

invaded the area and characterized the vegetation through at least 1961. By 1967, scrub vegetation had invaded the disturbed sites and today the firebreaks are characterized largely by Central Coastal Scrub. Some Mixed Chaparral vegetation also appears to have expanded into the break from the Woodland Chaparral along the western margin.

AREA 12 - The Lower Reservoir dates from the early 19th century. By 1938 the area behind the dam appears to have silted-in significantly and although virtually no Scrub/Shrub or Forested Wetland areas are evident from an aerial photo of that date, Emergent Wetland vegetation appears to have invaded portions of the wetland habitat. By 1954 some shrubs and a few trees are evident and only a small body of open water remained in the center of the reservoir. The remaining areas of reservoir were covered with Emergent Wetland vegetation. In contrast, much of the vegetation associated with the Upper Reservoir was apparent by 1938, although some open water persists today. By 1961 a significant amount of Scrub/Shrub and Forested Wetland areas appeared around the Lower Reservoir and also had colonized the bottomlands to the east. Emergent Wetland vegetation appears to have completely colonized the reservoir by that year. Today the reservoir is covered largely by Scirpus acutus with marginal areas dominated by shrubs of Salix lasiolepis and trees of S. lasiolepis and Quercus agrifolia. There is, however, a tremendous diversity of wetland species in other wetland areas associated with the Lower Reservoir.

SUMMARY - Based on the analysis of aerial photographs and the information provided by our evaluation of the botanical resources of the Park, a series of general observations about the stability of the vegetation and the trends in plant succession following disturbance can be made.

1. Particular examples of some plant communities appear to have been relatively stable over the past 45 years. They are as follows: Coast Live Oak Forest, Chamise Chaparral, Woodland Chaparral, Central Coastal Scrub, Northern Coastal Dune Scrub, and grasslands.
2. Stability of the above communities apparently depends on the length of time since the last disturbance, the type of habitat, and nature of the soil. Under the proper conditions, some examples of each of the above communities appear to be stable. For example, Central Coastal Scrub appears to be a stable community on south-facing slopes and apparently is not successional to Mixed Chaparral under these conditions. Similarly, Northern Coastal Dune Scrub is stable for long periods on flats or slopes of deep loose sandy soil and may not be successional to Central Coastal Scrub under these conditions.
3. Extensive disturbance at the Park has at least six origins:
 - 1) removal of native vegetation and cultivation of bottomlands and some slopes and mesa areas;
 - 2) removal of vegetation for firebreaks and unknown purposes;
 - 3) arson fires contained by firebreaks;
 - 4) uncontrolled fires, largely historical in nature;
 - 5) development of roads and paths;
 - 6) development of reservoirs and aqueduct system.
4. Upon abandonment of cultivation in bottomland and lower slopes, Cismontane Introduced Grasses colonized various sites. This community is successional to a phase of Central Coastal Scrub, often dominated by Baccharis pilularis and Lupinus arboreus along Purisima Canyon.

5. Chamise Chaparral can recover over about a 15 year period following a burn.
6. At some sites dense Chamise Chaparral has been replaced by open scrub vegetation composed of dominants from both Central Coastal Scrub and Mixed Chaparral following a burn.
7. Vegetation composed of Cismontane Introduced Grasses with scattered dominants of Central Coastal Scrub and Mixed Chaparral occurs in some areas where vegetation removal in one decade was followed by burns in subsequent decades.
8. Ceanothus Chaparral has colonized some areas where Chamise Chaparral has been removed but the soil remains.
9. Arctostaphylos Chaparral has colonized some areas where chaparral vegetation and soil has been removed and the Orcutt Formation exposed.
10. Woodland Chaparral does not always recover following a fire but may be replaced by only chaparral vegetation or Central Coastal Scrub. Oaks of Woodland Chaparral typically have multiple trunks that probably reflect a history of burning.
11. There is often a greater diversity of shrubs and herbaceous plants along service roads in Chamise Chaparral than there is within this community.
12. Forested Wetland has developed along Los Berros Creek since 1937 and was probably planted along the creek in the vicinity of the Mission where a greater diversity of species occurs.
13. Most of the Scrub/Shrub and Forested Wetland associated with the Lower Reservoir has developed since 1954, whereas the majority of

that associated with the Upper Reservoir was already apparent by 1938.

Flora

Due to the diversity of unusual or narrowly restricted habitats, endemic and relictual species, and numerous wildflowers, the Lompoc region has been of great interest to botanists for a long time (Smith, 1976). Much of the early interest was fostered by the collections of Ida Mae Blochman, who discovered a number of endemics during her exploration of the flora during the late 19th century. Since that time many botanists have investigated the area of Burton Mesa, Vandenberg Air Force Base and the Purisima Hills. La Purisima Mission State Historic Park and the Lompoc Region have been investigated for at least 20 years by Clifton Smith of the Santa Barbara Museum of Natural History, who compiled a checklist of species in 1970 for some adjacent sites in Purisima Canyon and the Mission Hills area. Additionally, an annotated checklist of plants cultivated in La Purisima Mission Garden was compiled by Edith Webb (1956). More recently, Vernon Human (1982) published a checklist of plants from the Park, concentrating on the blooming succession of native, naturalized, and cultivated species.

Analysis of the Inventory - The inventory of native and naturalized taxa of vascular plants, conducted by the authors between July, 1982 and June, 1983, resulted in the collection of 600 specimens from which 342 taxa representing 64 families were identified (Appendix III). This flora consists of 252 native and 90 naturalized plants, composing 73.7% and 26.3% of the flora, respectively. The three largest families represented at the Park are the Asteraceae (64 taxa, including 19 naturalized), Poaceae (39 taxa, including 22 naturalized), and Scrophulariaceae (21 taxa, including 1 naturalized). Together they constitute 36.3% of the

flora. Additional plants not collected or observed by the authors but reported by others (C. Smith, 1976; Human, 1982) are listed in Appendix V. They total 58 species, bringing the reported native and naturalized vascular flora to a total of 400 taxa.

Endemics - The extensive coastal dune system, sandy soils of Burton Mesa, and outcrops of diatomaceous earth support many plant taxa endemic to the greater Lompoc region, including southern San Luis Obispo County. The following 12 plants, arranged by family, were collected at the Park and are among those cited by C. Smith (1976) as endemic to this region, at least on the mainland.

- Asteraceae: Erigeron sanctarum
 Senecio douglasii (undescribed form)
- Boraginaceae: Amsinckia spectabilis var. microcarpa
- Brassicaceae: Erysimum suffrutescens var. lompocense
- Ericaceae: Arctostaphylos purissima (Fig. 27)
 A. rudis (Fig. 27)
- Ranunculaceae: Delphinium parryi ssp. blochmanae
- Rhamnaceae: Ceanothus impressus
 C. ramulosus var. fascicularis
- Rosaceae: Prunus fasciculata var. punctata (Fig. 27)
- Scrophulariaceae: Mimulus aurantiacus ssp. lompocensis
 Scrophularia atrata

La Purisima Mission State Historic Park is the type locality for two of these plants: Ceanothus ramulosus var. fascicularis and Erysimum suffrutescens var. lompocense.

Rare, Endangered or Threatened Plants - While no plants found at the Park are included on the official state list (State of California, 1982)

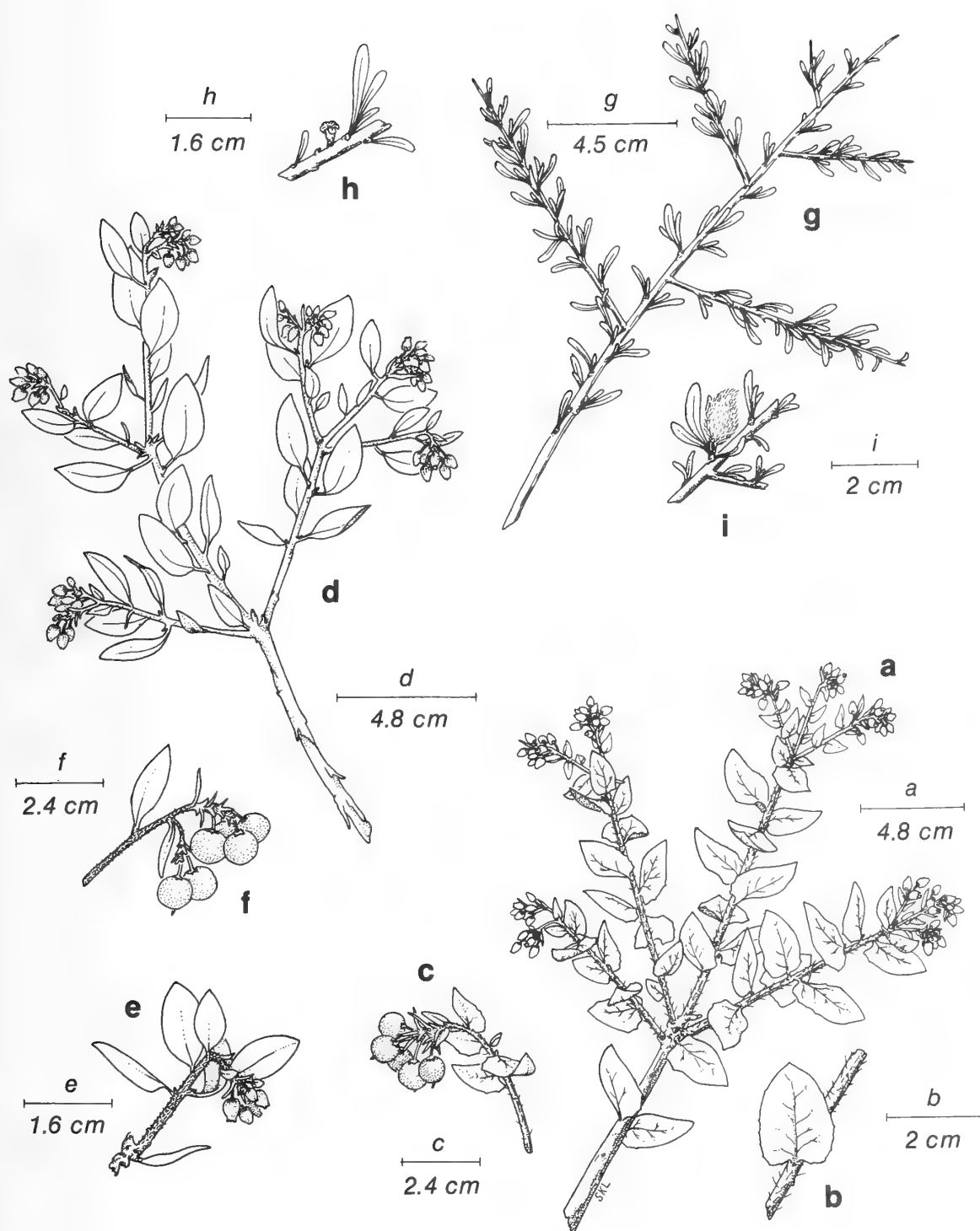


FIG. 27. Selected Regional Endemics: *Arctostaphylos purissima* — a. branch, flowering. b. leaf and twig. c. inflorescence, fruiting. *Arctostaphylos rudis* — d. branch, flowering. e. inflorescence and twig. f. inflorescence, fruiting. *Prunus fasciculata* var. *punctata* — g. branch. h. leaves, twig, and flower. i. leaves, twig, and fruit.

of rare, endangered or threatened plants, one species, Scrophularia atrata, is on the federal list (USDI, 1980) of plants currently under review. Scrophularia atrata was located in only one area of the Park (see: Appendix III), although it is occasional to common elsewhere in the region and more frequently occurs on outcrops of diatomaceous earth. It also is a characteristic species on the margins of dune swales on San Antonio Terrace, Vandenberg Air Force Base, where it is relatively abundant (HDR, 1980).

Additional taxa are listed by the California Native Plant Society (J. Smith et al., 1980; J. Smith, 1981) under various categories of concern. They are as follows:

<u>PLANT</u>	<u>STATUS</u>
	RARE AND ENDANGERED
<u>Arctostaphylos rudis</u> :	occurrence confined to several populations or to one extended population; endangered in a portion of its range; declining in number; (Fig. 27).
<u>Scrophularia atrata</u> :	occurrence confined to several populations or to one extended population; endangered in a portion of its range; increasing or stable in number.
	RARE BUT NOT ENDANGERED
<u>Arctostaphylos purissima</u> :	under consideration for inclusion in this category; (Fig. 27).
<u>Ceanothus impressus</u> :	under consideration for inclusion in this category.
<u>Erigeron sanctarum</u> :	increasing or stable in number.
<u>Erysimum suffrutescens</u> ssp. <u>Tompocense</u> :	endangered in a portion of its range.

Monardella undulata
var. undulata:

increasing or stable in number.

Prunus fasciculata
var. punctata:

increasing or stable in number; (Fig. 27).

Other Noteworthy Collections - In addition to endemic plants or those given an official status of rare, endangered or threatened, other species occur at the Park that are either rare locally or regionally, or are worthy of mention for another reason. These plants are as follows:

PLANT

STATUS

NEW COUNTY RECORDS

Conringia orientalis:

naturalized; rarely reported in California (Munz, 1968; McClintock, 1982).

Nemacladus
ramosissimus:

reported in Santa Barbara County only for upper Manzana Creek watershed (C. Smith, 1976).

Samolus parviflorus:

uncommon in Santa Barbara County; reported from Mission area in 1962 (C. Smith, 1976).

Wolffiella lingulata:

only recent collection in Santa Barbara County; other current sites include lakes on Nipomo Mesa, San Luis Obispo County.

HYBRIDS

Arctostaphylos
purissima X A. rudis:

a single hybrid plant was found in a patch of Arctostaphylos Chaparral on exposed Orcutt Formation. This is an inter-sectional hybrid of taxonomic significance.

Layia glandulosa X
L. paniculata:

hybrids between these species are common where the shaded habitat of L. paniculata occurs adjacent to the full-sun habitat of L. glandulosa. This is the first population of natural hybrids reported for this genus (B. Tanowitz, personal communication).

Mimulus spp.:

a hybrid population of shrubs occurs along El Camino Real just north of the Mission grounds and many include individuals arising from the following taxa: M. aurantiacus ssp. aurantiacus and ssp. Tompocense;

M. longiflorus var. longiflorus and var. rutilus. Although M. l. var. rutilus is probably an escape from the Mission gardens, it is not clear whether M. l. var. longiflorus is native to the Park.

Phytogeographic Considerations - The Park occurs in the area of California that is transitional between northern and southern floras, and occurs just north of the limit of southern California as defined by Munz (1974). This transition has been demonstrated previously in the discussion of vegetation, where northern communities (e.g., Northern Coastal Dune Scrub), southern communities (e.g., Southern Coastal Oak Woodland) and intermediate communities (e.g., Central Coastal Scrub) have been described from the area. It is not surprising that this transition is also noted in the distribution of individual species. For example, Encelia californica, characteristic of Coastal Sage Scrub in southern California, reaches its northern limit just northwest of the Park. It occurs in some Central Coastal Scrub on south-facing slopes of the Park, giving this community a distinctly southern influence.

Similarly, several northern species reach their southern limits in the Lompoc region. For example, at least three taxa, Carex montereyensis, Juncus effusus var. brunneus, and Stachys chamissonis, are characteristic of marshes to the north of this region and provide a distinctly northern aspect to wetlands of the Park. Another species, Scirpus acutus, characterizes many Emergent Wetlands of more interior, northern Santa Barbara County and is a dominant at the Park. It associates with S. californicus toward the coast and is replaced completely by it along the South Coast of Santa Barbara County.

The presence of regional endemics, in addition to northern and southern species, results in unique floristic associations. The diverse

number of habitats, resulting largely from the many different exposures of slope, degrees of slope grade, and water regimes, has provided a segregation of these plant associations. An analysis of floristic differences of the various physiographic areas and their habitats at the Park has resulted in the following observations: 1) Ceanothus impressus, a species characteristic of the Burton Mesa chaparral, occurs only on the western mesa, suggesting that this may be the southeastern limit of Burton Mesa chaparral; 2) Prunus fasciculata var. punctata characterizes some forms of Central Coastal Scrub on south-facing slopes and open bottomlands of the dissected eastern slope, suggesting that this species may characterize the eastern slope, which is a portion of the lower foothills of the Purisima Hills; 3) while the vegetation and flora of the Burton Mesa and Purisima Hills are distinct within the Park, the physiographic features merge at the head of Purisima Canyon, north of the Park, suggesting that additional work in that area might reveal more of the relationships between the plants of each area; 4) Lupinus albifrons, a species of more interior habitats, is often co-dominant in Northern Coastal Dune Scrub in the Park with L. chamissonis, a species more characteristic of the stabilized dunes along the immediate coast, illustrating another aspect of the transitional nature of Park habitats; 5) seeps along the eastern margin of Purisima Canyon and ravines dissecting the eastern slope provide wetland habitats for numerous hydrophytic species that do not occur elsewhere in the Park and several of which are rare for the region.

The floristic diversity and difference in species composition from area to area are documented in checklists for selected localities (Appendix V).

Cultivated Plants - A wealth of cultivated, native Californian species as well as exotics is maintained at the Park. The design and content of the mission garden is not authentic but an example of what might have been if the Mission had prospered (Webb, 1956). Only those plants introduced during the settlement of California by the Spanish padres and settlers, and those plants known by the mission's Native American residents for their useful properties were originally included and the total number of taxa exceeded 280 (Webb, 1956). Some of these were accounted for recently by Human (1982). In addition to the garden, other mission plantings include two large Populus fremontii (Fremont Cottonwood) in front of the Mission, Anemopsis californica (Yerba Mansa) at the womens' dormitory, and Platanus racemosa (Western Sycamore), Ribes aureum (Golden Currant), Salix lasiandra (Yellow-Willow), and others along Los Berros Creek in the vicinity of the mission garden.

In addition to garden plantings, there have been other introductions of species at various locations within the Park. For example, the grounds of the staff residences contain native Californian species such as Ceanothus thyrsiflorus (California Lavender), Lyonothamnus floribundus ssp. asplenifolius (Santa Cruz Island Ironwood), Rhus integrifolia (Lemonadeberry) and Romneya trichocalyx (Matilija Poppy), and exotics such as Eucalyptus spp. Additionally, the old homestead southeast of the filterhouse is the site of several persistent trees, including Cupressus macrocarpa (Monterey Cypress) and Juglans californica (California Walnut). The field in the bottomland of Purisima Canyon has been cultivated since at least the construction of the Mission and today supports an annual crop of mixed grasses, namely Hordeum vulgare var.

vulgare (Common Barley), H. vulgare var. trifurcatum (Beardless Barley), and Triticum aestivum (Cultivated Wheat).

Two additional areas of note are contained on the western margin of the Park on flats where native vegetation was removed prior to 1938. The northwestern corner is the site of a pine plantation, dating back to the post 1938 period. Trees included are Pinus attenuata (Knobcone Pine), P. muricata (Bishop Pine), P. radiata (Monterey Pine), P. sabiniana (Digger Pine), and P. torreyana (Torrey Pine). Several of these species, particularly P. muricata, appear to have been planted along the ridge portion of the service road east of the plantation. At least three species (P. muricata, P. radiata, P. torreyana) have naturalized within the Park, the most successful of which is apparently P. torreyana. Adjacent to and south of the pine plantation are open flats characterized by grassland, dune scrub, and chaparral. Planted among these communities are scattered, presumably planted, small oak trees (ca. 15 feet tall). They include Quercus agrifolia, that is native to the Park and might be natural here, Q. douglasii, more characteristic of inland sites, and Q. lobata, also characteristic of inland sites, particularly valleys. Individuals of the latter two species do not appear to be healthy under these growing conditions.

ENVIRONMENTAL SENSITIVITY

Management of the botanical resources of La Purisima Mission State Historic Park depends in part on the recognition of the environmental sensitivity of the various areas. For the purpose of this report, an environmentally sensitive area is an area supporting botanical resources (native plants or vegetation) that possesses one or more of the following attributes: 1) they are either rare, endangered, or of some other special concern; 2) they have a unique and significant role in the ecosystem; and 3) they are confined to particular habitats that are easily degraded by activities of man. The information reported herein contains sufficient comment on the vegetation and flora to provide a general analysis of the sensitivity of Park areas for native botanical resources.

Vegetation of Special Concern - The endemic forms of some upland plant communities in the Lompoc region are of special concern and warrant comment. For example, Central Coastal Scrub dominated by Prunus fasciculata var. punctata (Figs. 7 & 10) is endemic to this region and is restricted to sandy soils of certain largely south-facing slopes. Other forms of Central Coastal Scrub are dominated in part by another endemic, Mimulus aurantiacus ssp. lompocensis. However, this plant is more widespread and is not restricted to this community alone, making its habitats much less sensitive than those of some others.

The inland form of Northern Coastal Dune Scrub (Figs. 7 & 10) is uncommon, and apparently has the highest diversity of all plant communities at the Park. Of additional significance is the common occurrence of the endemic Erysimum suffrutescens ssp. lompocense and the hybrid Layia

glandulosa X L. paniculata, the latter being more common in this community than in any other, and which may be restricted to the Park and vicinity. The loose, sandy soil usually associated with this community may be subject to increased wind or water erosion if the vegetation is disturbed, and thus Northern Coastal Dune Scrub also may be sensitive due to the nature of the substrate. On the other hand the natural instability of this sandy soil could be a factor in maintaining the hybrid Layia on this site.

Chaparral vegetation of the Park (Fig. 7) is characterized by a series of endemic shrubs, including Arctostaphylos purissima, A. rudis, Ceanothus impressus, C. ramulosus var. fascicularis, and Mimulus aurantiacus ssp. lompocense (Figs. 10 & 15). Although most of these species are listed by the California Native Plant Society as rare, the community is much less sensitive to some forms of disturbance than are other communities. Historic evidence discussed herein suggests that vegetation removal and fire are important forms of disturbance that rejuvenate Ceanothus or Arctostaphylos Chaparral at the expense of Chamise Chaparral to which they may be successional. However, some of the endemics, and the community as a whole, are less common than in recent decades. Recovery of the community from some forms of disturbance does not imply that it is insensitive to all forms of disturbance or that loss of habitat is not threatening to the endemics. Of further interest is the contrast between the frequently disturbed portions of chaparral on the western mesa and chaparral of the eastern slope for which there is no evidence of disturbance during the past 45 years. The diversity of habitats, vegetation, and flora and the relative stability of the areas are worthy of further study to determine their relative sensitivity.

Additional upland communities of note are grasslands, Woodland Chaparral and Coast Live Oak Forest. Well-drained soils supporting Cismontane Introduced Grasses often are not sensitive. However, the unstable, sandy soils of the site along the western margin of Purisima Canyon (Fig. 7) support a number of native herbaceous species and could be seriously impacted by disturbance. Although Woodland Chaparral is not particularly uncommon or sensitive to disturbance at the Park, the western mesa portion is quite extensive and a noteworthy example. Coast Live Oak Forest is represented by a few narrowly-restricted examples that are sensitive due to the limited occurrence of north-facing slopes here. Associated with this community are examples of Cismontane Native Grassland and other mesic associations of species that are not found elsewhere in the Park.

Vegetated wetlands (Fig. 7) are among the most environmentally sensitive areas. No endemics or recognized rare, endangered or threatened species occur in these habitats at the Park. However, several regionally rare plants (e.g., Samolus parviflorus and Wolffiella lingulata), others near the southern limits of their range (e.g., Juncus effusus var. brunneus and Stachys chamissonis) and an unexpected diversity of native hydrophytes, mark the habitats as regionally significant wetlands. Since wetlands are easily degraded by various forms of human disturbance, they are environmentally sensitive habitats for their susceptibility to degradation as well as for their botanical resources.

Species of Special Concern - The species of special concern have been enumerated in the section BOTANICAL RESOURCES: Flora. These plants include regional endemics and rare or endangered species. The relative environmental sensitivity of habitats depends on the general status of a

species, its distribution within the Park, and its recovery after disturbance. There are three general categories into which species of special concern may be placed.

The first category includes those plants that are endemic to the region but within the Park are dominants or common characteristic taxa of particular communities. These are Arctostaphylos purissima, A. rudis, Ceanothus ramulosus var. fascicularis, Erysimum suffrutescens var. lompocense, Mimulus aurantiacus ssp. lompocensis, and Prunus fasciculata var. punctata (Figs. 10 & 15). These plants are not threatened within the Park and for the most part are common in the Lompoc region within the habitats to which they are restricted.

The second category includes those plants that are endemic to the Lompoc region, but within the Park are occasional, uncommon, or rare. These taxa include Ceanothus impressus, Delphinium parryi ssp. blochmanae, Erigeron sanctarum, and Scrophularia atrata. Collection or observation sites (environmentally sensitive areas) for these plants are illustrated because of their apparent limited occurrence (Fig. 28).

The third category includes those plants that are not endemic to the Lompoc area but are regionally rare, and thus the habitats within the Park are of significance to their distribution in California. These species include Nemacladus ramosissimus, Samolus parviflorus, and Wolffiella lingulata, and locations of their environmentally sensitive areas are illustrated (Fig. 28).

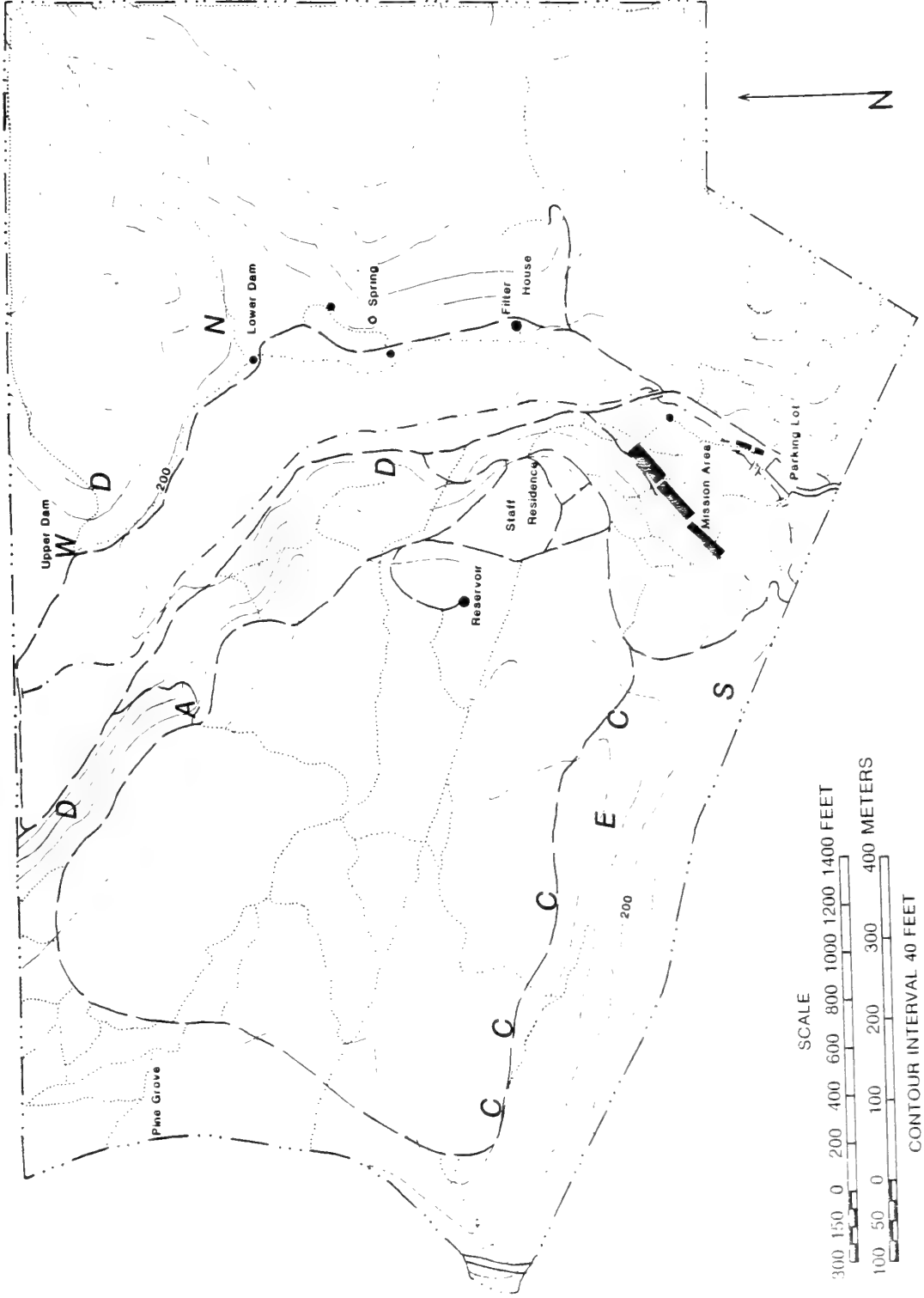
Of final note are the locations of regionally rare natural hybrids. Those between Layia glandulosa and L. paniculata are common within the Park. While of great botanical interest and restricted general occurrence, they appear to occur wherever the habitats of the two parents are

FIGURE 28. ENVIRONMENTALLY SENSITIVE AREAS FOR SELECTED PLANTS OF SPECIAL CONCERN

A	<u>Actostaphylos purissima</u> X <u>A. rudis</u>
C	<u>Ceanothus impressus</u>
D	<u>Delphinium parryi</u> ssp. <u>blochmanae</u>
E	<u>Erigeron sanctarum</u>
N	<u>Nemacladus ramosissimus</u>
S	<u>Scrophularia atrata</u>
W	<u>Wolffiella lingulata</u>

La Purisima Mission State Historic Park

Lompoc, California



adjacent to each other. In contrast, only one plant of the hybrid Manzanita (Arctostaphylos purissima X A. rudis) was located (Fig. 28). This plant occurs in Arctostaphylos Chaparral at an exposure of Orcutt Formation. The Mimulus hybrids are in need of further study but appear to be related to material introduced at the mission garden and perhaps are of little significance to the Park.

RECOMMENDATIONS AND COMMENTS

Recommendations offered by the team of investigators are based upon the data gathered during this study and upon general recommendations or observations reported by others. Our concerns relate primarily to the botanical resources and thus recommendations for management of the vegetation and flora may not be identical to those offered for zoological, archaeological or other resources of the Park. All recommendations should be considered as preliminary suggestions made for careful review before any implementation is considered.

A. Resources of Special Concern

1. Protection should be given or other appropriate management procedures applied to all species of special concern, including endemics and rare plants.
2. Protection should be given or other appropriate management procedures applied to all plant communities or associations of special concern.

B. Eastern Portion of the Park

The lack of recent disturbance, other than from foot or equestrian traffic on trails, and the great diversity of habitats and plant communities suggest that the eastern portion of the Park be preserved or otherwise managed to maintain the diversity. Wetlands of the area have high sensitivity and should be protected.

3. Controlled burning should be conducted only in a limited manner in the Chamise Chaparral or the Woodland Chaparral in the eastern portion of the Park because a potential increase in erosion on the canyon slopes after fires could impact the wetlands seriously by increasing rates of siltation.

C. Western Portion of the Park

The complex land use and disturbance history of the western mesa, in addition to extant old stands of Chamise Chaparral and Woodland Chaparral, suggest that management procedures different than those for the eastern slope could be implemented here.

4. Controlled burns could be conducted in stands of Central Coastal Scrub, Chamise Chaparral and Woodland Chaparral that have not been disturbed or burned for over 45 years (see: Land Use, and Vegetation). Complete fire suppression in areas such as these is now considered archaic (Oberbauer, 1982) and may result in reduced productivity and diversity of the vegetation.
5. As documented herein, repeated burning and/or vegetation removal over short intervals favors herbaceous species and open vegetation, while similar disturbances over longer periods favor dense shrub cover, particularly in chaparral vegetation. If an increase in herbaceous species and a decrease in shrub density is desired, controlled burning should be conducted, preferably on a rotational basis among many selected sites. This would result in an enhancement of the mosaic of associations and habitats that now occur to a more limited degree.
6. Areas with a long fire cycle (i.e., those that burn infrequently such as every 40-100 years) often have more dead shrubs prior to a fire and thus fewer potential resprouts from living individuals after fires. Areas with a short fire cycle (i.e., those that burn more frequently such as about every 25 years) often have fewer dead shrubs prior to the fire and thus more potential resprouts depending on the association of species (Keeley, 1977). Burning of old chaparral

might provide more open areas as habitats for a greater diversity of colonizing species than burning of younger stands that might regenerate faster from sprouting of shrubs that survive fires. While these comments seem at first to contradict those of No. 5, the degree of disturbance and the duration between disturbances including fires has a profound effect on the resulting vegetation. Therefore we recommend careful analysis of these parameters and others, such as time of year for controlled burning, before implementation of programs.

7. Different chaparral dominants often respond differently to disturbances. For example, Arctostaphylos rudis has burls and thus will resprout from the base after fires. On the other hand, A. purissima does not have burls and may reestablish in areas only from germination of seeds in the seed bank or from introduction of seeds from adjacent areas. Similar contrasting responses may occur between Ceanothus ramulosus and C. impressus. Ceanothus impressus at the Park apparently grows only at the edge of chaparral along the service road (Fig. 26), while C. ramulosus is widespread. We recommend that careful analysis be made of such variable phenomena to be certain that controlled burning in an area would not result in the permanent reduction or elimination of a species that does not respond well to fire.
8. Controlled burning should take place in the late summer or fall after the year's seed is set. Natural burning of chaparral vegetation usually occurs during this period (Oberbauer, 1982).
9. Burns may result in an increase in pine seedlings. Because several naturalized species are currently increasing in number in the Park,

some effort should be made to avoid further establishment of these pines. Perhaps trees and cones should be removed from areas before burning takes place.

10. Firebreaks have a profound effect on the native vegetation. It often takes many decades before similar vegetation is restored to the site. Therefore, placement of firebreaks, if any more are needed, should be done so as to avoid sensitive areas.

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L I T E R A T U R E C I T E D

- Barbour, M. G., T. M. DeJong, and A. F. Johnson. 1975. Additions and corrections to a review of North American Pacific Coast beach vegetation. *Madrono* 23:130-134.
- and A. F. Johnson. 1977. Beach and dune. p. 223-261, in: M. G. Barbour and J. Major. *Terrestrial vegetation of California*. John Wiley & Sons, New York.
- Burk, G. F. 1941. Vegetation type and forest condition maps of California and Western Nevada, Lompoc Quadrangle (Southwest Quarter). USDA, Forest Service and California Forest and Range Experiment Station.
- Cheatham, N. H. and J. R. Haller. 1975. An annotated list of California habitat types. University of California Natural Land and Water Reserves System.
- Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Dibblee, T. W., Jr. 1950. Geology of Southwestern Santa Barbara County, California. *Calif. Div. Mines Bull.* 150.
- Elford, C.R. 1972. Climate. p. 174-177, in: Shipman, G.E. *Soil Survey of the Northern Santa Barbara Area*. USDA, Soil Conservation Service and UC Agr. Exper. Sta.
- Engbeck, J. H., Jr. Undated. La Purisima Mission State Historic Park. State of California, Department of Parks and Recreation.
- Hanes, L. L. 1977. California chaparral. p. 417-469, in: M. G. Barbour and J. Major. *Terrestrial vegetation of California*. John Wiley & Sons, New York.
- HDR. 1980. Biological assessment for proposed MX Flight Test Program, Vandenberg Air Force Base, California. Prepared for United States Air Force Ballistic Missile Office, Norton Air Force Base, California. Henningson, Durham and Richardson, Sciences Division, Santa Barbara, California.
- Hoover, R. F. 1970. The vascular flora of San Luis Obispo County, California. University of California Press, Berkeley.
- Human, V. 1982. Wild flower blooming succession at La Purisima Mission, Lompoc, California. Chaparral Press, Lompoc, CA.
- Keeley, J. E. 1977. Fire-dependent reproductive strategies in Arctostaphylos and Ceanothus. p. 391-396, in: Proceedings of the symposium on the environmental consequences of fire and fuel management in Mediterranean ecosystems. U.S. Forest Service, Washington D.C.

- McClintock, E. 1982. An annotated list of escaped exotics in California. California Native Plant Society.
- Mooney, H. A. 1977. Southern coastal scrub. p. 471-489, in: M. G. Barbour and J. Major: Terrestrial vegetation of California. John Wiley & Sons, New York.
- Muller, C., W. Muller, and B. Haines. 1964. Volatile growth inhibitors produced by aromatic shrubs. Science 143:417-473.
- Munz, P. A. 1959. A California flora. Univ. California Press, Berkeley
- . 1968. Supplement to a California flora. Univ. California Press, Berkeley.
- . 1974. A flora of southern California. Univ. California Press, Berkeley.
- Oberbauer, T. 1982. The pros and cons of controlled burning. Fremontia 10:16-18.
- Shipman, G. E. 1972. Soil survey of the northern Santa Barbara Area. USDA, Soil Conservation Service and UC Agr. Exper. Sta.
- Smith, C. F. 1976. A flora of the Santa Barbara Region, California. Santa Barbara Museum of Natural History, Santa Barbara, CA.
- Smith, J. P., R. J. Cole, and J. O. Sawyer, Jr. 1980. Inventory of rare and endangered vascular plants of California. California Native Plant Society, Spec. Publ. No. 1 (ed. 2).
- Smith, J. P. 1981. Inventory of rare and endangered vascular plants of California, First Supplement. California Native Plant Society, Spec. Publ. No. 1 (ed. 2).
- State of California. 1982. Designated endangered or rare plants. Department of Fish and Game.
- United States Department of Agriculture. 1980. Endangered and threatened wildlife and plants: Review of plant taxa for listing on endangered or threatened species. Federal Register 45:82480-82569.
- Upton, J. E., M. G. Thomasson, Jr., and others. 1951. Geology and water resources of Santa Ynez River Valley, Santa Barbara County, California. U.S. Geol. Surv. Water Supply Paper 1107.
- Webb, E. 1956. The garden plants of La Purisima Mission. (unpublished).
- Woodring, W. P., M. N. Bramlett. 1950. Geology and paleontology of the Santa Maria district, California: U.S. Geol. Surv. Prof. Paper 222.

APPENDIX I
CLASSIFICATION OF UPLAND VEGETATION

LA PURISIMA MISSION STATE HISTORIC PARK

UPLAND VEGETATION

Upland vegetation at La Purisima Mission State Historic Park is dependent upon the diverse topographic features of the area, such as the Burton Mesa, Purisima Hills and Purisima Canyon, and the largely sandy substrates derived from the Orcutt Formation. The following hierarchical classification, modified after Cheatham and Haller (1975), illustrates in some detail various characteristics of a majority of upland vegetation categories dominated by vascular plants. Intraspecific taxa are excluded below but are listed in the Annotated Catalogue.

CLASSIFICATION OF UPLAND VEGETATION

Based on Cheatham and Haller (1975)

MAJOR CATEGORY: Dune Habitats

HABITAT TYPE: Partially Stabilized and Stabilized Coastal Dune

MAJOR SUBDIVISION: Coastal Dune Scrub

MINOR SUBDIVISION: Northern Coastal Dune Scrub

CHARACTERISTIC SPECIES: Artemisia californica
Baccharis pilularis
Corethrogyne filaginifolia
Croton californicus
Ericameria ericoides
Erysimum suffrutescens
Horkelia cuneata
Lupinus albifrons
L. arboreus
L. chamissonis
Phacelia ramosissima
Rhamnus californica
Senecio douglasii

MAJOR CATEGORY: Scrub and Chaparral

HABITAT TYPE: Coastal Scrub

MAJOR SUBDIVISION: Central Coast Scrub

CHARACTERISTIC SPECIES: Artemisia californica
Baccharis pilularis
Corethrogyne filaginifolia
Ericameria ericoides
Eriophyllum confertiflorum
Erysimum suffrutescens
Helianthemum scoparium
Mimulus aurantiacus
Phacelia ramosissima
Prunus fasciculata
Rhamnus californica
R. crocea
Salvia mellifera
Senecio douglasii
Toxicodendron diversilobum

HABITAT TYPE: Chaparral

MAJOR SUBDIVISION: Mixed Chaparral

MINOR SUBDIVISION: California Mixed Chaparral

CHARACTERISTIC SPECIES: Adenostoma fasciculatum
Arctostaphylos purissima
A. rudis
Ceanothus impressus
C. ramulosus
Cercocarpus betuloides
Helianthemum scoparium
Heteromeles arbutifolia

Lotus scoparius
Mimulus aurantiacus
Phacelia ramosissima
Quercus agrifolia
Rhamnus californica
R. crocea
Toxicodendron diversilobum

MAJOR SUBDIVISION: Chamise Chaparral

CHARACTERISTIC SPECIES: Adenostoma fasciculatum
Arctostaphylos purissima
A. rudis
Ceanothus impressus
C. ramulosus

MAJOR CATEGORY: Grasslands

HABITAT TYPE: Valley and Foothill Grasslands

MAJOR SUBDIVISION: Cismontane Native Grassland

CHARACTERISTIC SPECIES: Bromus carinatus*
Melica imperfecta*
Poa scabrella*
Stipa cernua
S. lepida

*Usually not found growing together in a grassland community, but as patches or clumps within scrub, chaparral, or forest communities.

MAJOR SUBDIVISION: Cismontane Introduced Grasses

CHARACTERISTIC SPECIES: Amsinckia spp.
Avena spp.
Bromus spp.
Camissonia spp.
Clarkia spp.
Croton californicus
Cryptantha spp.
Delphinium parryi
Eriastrum densifolium
Erodium spp.
Hemizonia increscens
Heterotheca spp.
Hypochoeris glabra
Layia spp.
Lessingia germanorum
Linaria canadensis
Lupinus spp.
Meconella linearis
Medicago polymorpha
Orthocarpus purpurascens
Phacelia spp.
Salvia columbariae
Vulpia spp.

MAJOR CATEGORY: Woodlands (trees scattered)

HABITAT TYPE: Oak Woodlands

MAJOR SUBDIVISION: Southern Oak Woodlands

MINOR SUBDIVISION: Southern Coastal Oak Woodland

CHARACTERISTIC SPECIES: Claytonia perfoliata
Heteromeles arbutifolia
Quercus agrifolia
Rhamnus californica
Sambucus mexicana
Toxicodendron diversilobum

MAJOR CATEGORY: Forests (closed canopy)

HABITAT TYPE: Broadleaved Evergreen Forests

MAJOR SUBDIVISION: Live Oak Forests

MINOR SUBDIVISION: Coast Live Oak Forest

CHARACTERISTIC SPECIES: Bromus carinatus
Claytonia perfoliata
Dryopteris arguta
Heteromeles arbutifolia
Quercus agrifolia
Rhamnus californica
Sambucus mexicana
Toxicodendron diversilobum

APPENDIX II
CLASSIFICATION OF VEGETATED WETLANDS

LA PURISIMA MISSION STATE HISTORIC PARK
WETLAND VEGETATION

Wetlands at La Purisima Mission State Historic Park are associated with Los Berros Creek and its seasonally wet tributaries, springs, or impounded areas that were once reservoirs for the historic mission. These wetlands can be grouped into two systems (Cowardin et al., 1979) as follows: 1) the Riverine System, containing wetlands in river- or streambeds that when vegetated are characterized by nonpersistent plant types and are flooded by water with an average annual low salinity less than 0.05% from ocean derived salts; and 2) the Palustrine System, including wetlands that when vegetated are characterized by persistent plant types (or if nonpersistent vegetation occurs, the habitat is not a river- or streambed), and that are flooded by water with an average annual salinity less than 0.05% from ocean derived salts. The following hierarchical classification, modified after Cowardin et al. (1979), illustrates in some detail various characteristics of a majority of wetland types vegetated by vascular plants. Intraspecific taxa are excluded below but are listed in the Annotated Catalogue.

CLASSIFICATION OF THE VEGETATED WETLANDS

SYSTEM: Riverine

SUBSYSTEM: Intermittent

CLASS: Streambed

SUBCLASS: Vegetated

WATER REGIME: Seasonally Flooded

CHARACTERISTIC SPECIES: Epilobium adenocaulon
Oenothera hookeri

SYSTEM: Palustrine

CLASS: Aquatic Bed

SUBCLASS: Floating

WATER REGIMES: Permanently, Semipermanently, and
Seasonally Flooded

HABITATS: reservoirs, aqueduct, cisterns

CHARACTERISTIC SPECIES: Azolla filiculoides
Lemna minima
Wolffiella lingulata

CLASS: Emergent Wetland

SUBCLASS: Persistent

WATER REGIMES: Permanently or Semipermanently Flooded

HABITAT: reservoirs

CHARACTERISTIC SPECIES: Oenanthe sarmentosa
Scirpus acutus
S. microcarpus
Sparganium eurycarpum
Typha latifolia
Woodwardia fimbriata

WATER REGIMES: Permanently, Semipermanently and
Seasonally Flooded, or Saturated

HABITATS: reservoirs, mouths of canyons, seeps, margins
of aqueduct

CHARACTERISTIC SPECIES: Carex spp.
Eleocharis palustris
Elymus spp.
Juncus spp.
Oenanthe sarmentosa
Phalaris aquatica
Psoralea orbicularis
Rumex spp.
Scirpus microcarpus
Solidago spp.
Urtica holosericea

HABITAT: aqueduct

CHARACTERISTIC SPECIES: Epilobium adenocaulon
Gnaphalium luteo-album
Juncus bufonius
Mimulus guttatus

Oenothera hookeri
Polypogon monspeliensis
Samolus parviflorus
Scirpus cernuus

WATER REGIME: Seasonally or Temporarily Flooded
HABITATS: canyon bottomlands (assoc. with Scrub/Shrub Wetland)

CHARACTERISTIC SPECIES: Carex spp.
Distichlis spicata
Juncus textilis
Muhlenbergia rigens
Vicia exigua

WATER REGIME: Seasonally or Temporarily Flooded
(transitional to SUBCLASS: Nonpersistent)

HABITATS: roadbeds below reservoirs, adjacent to seeps

CHARACTERISTIC SPECIES: Distichlis spicata
Gnaphalium luteo-album
Hordeum geniculatum
Juncus bufonius
Lolium perenne
Lythrum hyssopifolia
Poa annua
Polypogon monspeliensis
Spergularia marina
Vulpia myuros

CLASS: Scrub/Shrub Wetland

SUBCLASS: Broad-leaved Deciduous

WATER REGIMES: Permanently, Semipermanently, Seasonally
and Temporarily Flooded, and Saturated

HABITATS: margins of reservoirs, bottomlands, seeps

CHARACTERISTIC SPECIES: Salix lasiolepis

SUBCLASSES: Broad-leaved Deciduous and Evergreen

WATER REGIME: Seasonally and Temporarily Flooded, and
Saturated

HABITATS: margins of reservoirs, bottomlands,
streambanks, seeps

CHARACTERISTIC SPECIES: Artemisia douglasiana
Baccharis pilularis
Lonicera subspicata
Rhamnus californica
Rosa californica
Rubus ursinus
Sambucus mexicana
Toxicodendron diversilobum

WATER REGIME: Temporarily Flooded

HABITAT: bottomlands (transitional to upland scrub
vegetation)

CHARACTERISTIC SPECIES: Artemisia douglasiana
Baccharis pilularis

Ericameria ericoides
Eriophyllum confertiflorum
Horkelia cuneata
Rhamnus californica
Rosa californica
Rubus ursinus
Satureja douglasii

SUBCLASS: Broad-leaved Evergreen

WATER REGIME: Seasonally and Temporarily Flooded

HABITATS: bottomlands, mouths of canyons

CHARACTERISTIC SPECIES: Baccharis pilularis

CLASS: Forested Wetland

SUBCLASSES: Broad-leaved Deciduous and Evergreen

WATER REGIMES: Permanently, Semipermanently, Seasonally
and Temporarily Flood and Saturated

HABITATS: margins of reservoirs, bottomlands, seeps, and
streambanks

CHARACTERISTIC SPECIES: Platanus racemosa
Populus trichocarpa
Quercus agrifolia
Salix laevigata
S. lasiandra
S. lasiolepis

APPENDIX III
ANNOTATED CATALOGUE OF THE VASCULAR PLANTS

INTRODUCTION

The Annotated Catalogue includes all native and naturalized species of plants found in the Park during this study. It is arranged according to phylogenetic order of ferns, gymnosperms and angiosperms. Within these groups, the families, genera and species are in alphabetical order. Additional plants are listed in the Addendum to the Catalogue and in Appendix IV: Additional Plants Reported by Other Investigators.

The information on each plant includes the scientific name, common name (if one exists), habit (annual, perennial herb, subshrub, shrub, tree), occurrence/abundance, habitat/plant community, collection number, and "naturalized" if it is not native to the site. Although most of the nomenclature is consistent with Munz (1959, 1968, 1974), other names have been applied to some plants in which case synonyms also may be listed. Occurrence refers to the general distribution of a plant within the Park (rare, uncommon, scattered, occasional, common or abundant), while abundance uses these same terms to describe the relative number of plants at any one site. Habitat is the kind of place in which a plant usually grows (e.g., slopes, mesas, reservoirs, etc.). Plant community is that association of plants in which the species most often occurs; communities are described in the text and in Appendices I and II and are mapped in Fig. 7. Collection number is the number of the voucher specimen(s) of the species that are deposited at the UCSB Herbarium. Naturalized species are those that were introduced from outside the site (e.g., other countries) and are either escapes from cultivation or widespread weeds. Platanus racemosa and Salix lasiandra may have been planted in Los Berros Creek but are otherwise native to the general region. The many species of cultivated plants at the Park, including those that persist long after planting but do not reproduce (e.g. Cupressus sp., Quercus spp., and some Pinus spp.) are not included herein.

ANNOTATED CATALOGUE

DIVISION TRACHEOPHYTA

SUBDIVISION PTEROPSIDA

CLASS FILICAE

ASPIDIACEAE

Dryopteris arguta (Kaulf.) Watt. Coastal Wood Fern. Perennial herb; uncommon/occasional; northeast-facing slope/oak forest; LP 441.

BLECHNACEAE

Woodwardia fimbriata Sm. in Rees. Chain Fern. Perennial herb; rare/common; stream bank/emergent wetland; LP 15.

PTERIDACEAE

Pityrogramma triangularis (Kaulf.) Maxon var. triangularis. Goldenback Fern. Perennial herb; scattered/occasional to common; north-facing slopes/coastal scrub, oak forest; LP 137, 294.

Pteridium aquilinum (L.) Kuhn. var. pubescens Underw. Western Bracken. Perennial herb; common/common; ridges, slopes/coastal scrub, chaparral; LP 587.

SALVINIACEAE

Azolla filiculoides Lam. Duckweed Fern. Annual; scattered/abundant; reservoirs, aqueduct, cisterns/aquatic bed-floating; LP 55.

CLASS CONIFERAE

PINACEAE Pine Family

Pinus muricata D. Don. Bishop Pine. Tree; common/occasional; pine grove, chaparral; LP 323; cultivated and naturalized on the site; native in nearby habitats (e.g., Pine Canyon, Purisima Hills, Burton Mesa).

Pinus radiata D. Don. Monterey Pine. Tree; uncommon/occasional; mesas, ridges/chaparral; no collection; cultivated and naturalized.

Pinus torreyana Parry ex Carr. Torrey Pine. Tree; occasional/occasional; mesas, ridges/chaparral; no collection; cultivated and naturalized.

CLASS ANGIOSPERMAE

SUBCLASS DICOTYLEDONES

AIZOACEAE Carpet Weed Family

Carpobrotus edulis (L.) Bolus. Hottentot Fig. Succulent perennial; uncommon/common; firebreak; LP 373a; naturalized.

Carpobrotus edulis (L.) Bolus. X C. equilaterus (Haw.) N.E. Brown. Succulent perennial; uncommon/common; firebreak; LP 373b.

Conicosia pugioniformis (L.) N.E. Br. Perennial herb; uncommon/occasional; mesas/grassland; LP 417; naturalized.

ANACARDIACEAE Sumac Family

Schinus molle L. Pepper Tree. Tree; occasional/common; canyon bottom/grassland, forested wetland; LP 133; naturalized.

Toxicodendron diversilobum (T. & G.) Greene. Poison Oak. Shrub; common/common to abundant; mesa, slopes, ridges, ravines/coastal scrub, chaparral, oak woodland, oak forest, scrub-shrub wetland, forested wetland; no collection.

APIACEAE Carrot Family

Apiastrum angustifolium Nutt. in T. & G. Wild-Celery. Annual; occasional/common; mesa, north-facing slopes/dune scrub, coastal scrub, grassland; LP 286, 305a, 408.

Apium leptophyllum (Pers.) F. Muell. ex Benth. & Muell. Annual; uncommon/abundant; lawn/grassland; LP 146; naturalized.

Bowlesia incana R. & P. Annual; scattered/common; mesas, north-facing slopes/coastal scrub, oak woodland; LP 166.

Caucalis microcarpa H. & A. Annual; occasional/occasional; mesas/dune scrub, coastal scrub; LP 410, 436.

Conium maculatum L. Poison Hemlock. Biennial; occasional/scattered; roadside, cultivated field/grassland; LP 475; naturalized.

Daucus pusillus Michx. Rattlesnake Weed. Annual; occasional/common; mesas/dune scrub, coastal scrub, grassland; LP 305b, 310c, 409.

Oenanthe sarmentosa Presl. American Oenanthe. Perennial herb; occasional/common; margins of reservoirs, seeps/emergent wetland, forested wetland; LP 12, 119.

Sanicula crassicaulis Poepp. ex DC. Pacific Snakeroot. Perennial herb; occasional/scattered; north-facing slopes/oak forest; LP 198.

Sanicula laciniata H. & A. Perennial herb; uncommon/common; northwest-facing slope/chaparral; LP 292.

APOCYNACEAE Dogbane Family

Vinca major L. Periwinkle. Perennial herb; uncommon/common; margin of stream bank/forested wetland; LP 196; naturalized.

ASTERACEAE Sunflower Family

Achillea millefolium L. var. californica (Pollard) Jeps. Yarrow. Perennial herb; uncommon/uncommon; slopes/coastal scrub, oak forest; LP 516.

Anthemis cotula L. Mayweed. Annual; uncommon/occasional; cultivated field/grassland; LP 2; naturalized.

Artemisia californica Less. Coastal Sagebrush. Shrub; common/common; mesas, slopes, bottomlands/dune scrub, coastal scrub, chaparral; LP 570.

Artemisia douglasiana Bess. in Hook. Mugwort. Perennial herb; common/common; bottomlands/emergent wetland, scrub-shrub wetland; LP 582.

Artemisia dracunculus L. Tarragon. Perennial herb; occasional/common; slopes/dune scrub, coastal scrub; LP 108.

Baccharis douglasii DC. Subshrub; occasional/occasional; margin of reservoirs, seeps/emergent wetland, scrub-shrub wetland; LP 62,103.

Baccharis pilularis DC. ssp. consanguinea (DC.) C. B. Wolf. Coyote Brush. Shrub; common/common; mesas, slopes margins of reservoirs, flats/coastal scrub, chaparral, scrub-shrub wetland; LP 593.

Carduus pycnocephalus L. Italian Thistle. Annual; uncommon/uncommon; roadside/chaparral; LP 485; naturalized.

Centaurea melitensis L. Tocalote. Annual; occasional/common; mesas, south-facing slopes/dune scrub, coastal scrub; LP 497; naturalized.

Chaenactis glabriuscula DC. var. denudata (Nutt.) Munz. Pebble Pincushion. Annual; common/common to abundant; mesas, slopes/dune scrub, coastal scrub, grassland; LP 352, 389.

Cirsium occidentale (Nutt.) Jeps. Cobweb Thistle. Annual; occasional/scattered to common; mesas, south-facing slopes/dune scrub, coastal scrub, grassland; LP 29, 306.

Cnicus benedictus L. Blessed Thistle. Annual; uncommon/common; mesas/coastal scrub, grassland; LP 406; naturalized.

Conyza bonariensis (L.) Cronq. Flax-Leaved Fleabane. Annual, uncommon/occasional to common; mission grounds; LP 581; naturalized.

Conyza canadensis (L.) Cronq. Horseweed. Annual; uncommon/common; roadside; LP 562; naturalized.

Corethrogyne filaginifolia (H. & A.) Nutt. var. latifolia Thell.
Cudweed-Aster. Subshrub; common/common; south-facing slopes,
mesas/coastal scrub, dune scrub, grassland; LP 219.

Cotula australis (Sieber) Hook. Annual; occasional/common; mesas,
roadbeds/chaparral, grassland; LP 290, 487; naturalized.

Encelia californica Nutt. California Bush Sunflower. Shrub;
occasional/occasional to common; slopes/coastal scrub, chaparral; LP
310b.

Ericameria ericoides (Lessing) Jepson ssp. ericoides [Haplopappus
ericoides]. Mock Heather. Shrub; common/common; mesas, slopes/dune
scrub, coastal scrub, chaparral; LP 85.

Erigeron sanctarum Wats. Perennial herb; rare/uncommon; southwest-facing
slope/chaparral; LP 501.

Eriophyllum confertiflorum (DC.) Gray var. confertiflorum. Golden
Yarrow. Shrub; common/common; mesas, slopes/dune scrub, coastal scrub,
chaparral; LP 493.

Eriophyllum multicaule (DC.) Gray. Annual; occasional/common to
abundant; mesas, south-facing slopes/dune scrub, coastal scrub; LP 175,
221, 229.

Filago californica Nutt. Annual; common/common; mesas, slopes/dune
scrub, coastal scrub, chaparral, grassland; LP 303, 401, 427a.

Filago gallica L. Annual; common/common; mesas, slopes/dunes scrub,
coastal scrub, chaparral, grassland; LP 402, 415; naturalized.

Gazania longiscapa DC. Perennial herb; rare/rare; roadside; LP 370;
naturalized.

Gnaphalium beneolens Davids. Perennial herb; occasional/scattered;
mesas, south-facing slopes/dune scrub, coastal scrub, chaparral; LP 67,
546, 556.

Gnaphalium bicolor Bioletti. Bicolored Cudweed. Perennial herb;
occasional/occasional; south-facing slopes, ridges/coastal scrub,
chaparral; LP 216, 237, 247, 312.

Gnaphalium chilense Spreng. var. chilense. Annual; scattered/uncommon;
road margins, north-facing slope/grassland; LP 52b, 341.

Gnaphalium luteo-album L. Annual; occasional/occasional to common; lawn,
roadbed/grassland, emergent wetland; LP 202; naturalized.

Gnaphalium ramosissimum Nutt. Biennial; occasional/occasional;
mesas/coastal scrub, chaparral, oak woodland; LP 21, 284, 370.

Hedypnois cretica (L.) Willd. Annual; uncommon/common; western mesa/dune
scrub, coastal scrub; LP 357; naturalized.

- Helenium puberulum DC. Rosilla. Biennial; uncommon/uncommon; margins of aqueduct/emergent wetland; LP 126.
- Hemizonia increscens (Hall ex Keck) Tanowitz ssp. increscens. Annual; common/common; mesas, south-facing slopes/grassland; LP 96.
- Heterotheca echioides (Benth.) [Chrysopsis villosa var. echioides]. Hairy Golden Aster. Perennial herb; occasional/common; south-facing slopes/dune scrub, coastal scrub; LP 17.
- Heterotheca grandiflora Nutt. Telegraph Weed. Annual, biennial; uncommon/occasional; mesas/dune scrub, coastal scrub, chaparral; LP 190.
- Hypochoeris glabra L. Smooth Cat's Ear. Annual; common/abundant; mesas, south-facing slopes/dune scrub, coastal scrub, grassland; LP 189, 462; naturalized.
- Isocoma veneta (HBK.) Greene var. vernonioides (Nutt.) Jeps. [Haplopappus venetus ssp. vernonioides]. Perennial herb; occasional/common; mesa, roadside/coastal scrub; LP 114, 573.
- Lactuca serriola L. var. serriola. Prickly Lettuce. Annual; uncommon/scattered; roadside; LP 560; naturalized.
- Lasthenia californica DC. ex Lindley. Goldfields. Annual; common/abundant; mesas, west and south-facing slopes/dune scrub, coastal scrub; no collection.
- Layia glandulosa (Hook.) H. & A. White Layia. Annual; common/common to abundant; mesas, slopes/dune scrub, coastal scrub, grassland; LP 167, 250, 270, 358, 388, 404a.
- Layia glandulosa (Hook.) H. & A. X L. paniculata Keck. Annual; occasional/occasional; mesas, slopes/dune scrub, coastal scrub, grassland; LP 307b, 360, 404c.
- Layia paniculata Keck. Slender Layia. Annual; occasional/common; mesas, slopes/dune scrub, coastal scrub, oak woodland, oak forest; LP 307a, 359, 404b, 440.
- Lessingia germanorum Cham. var. pectinata (Greene) J. T. Howell. Annual common/common; mesas, slopes/dune scrub, coastal scrub, grassland; LP 30, 74.
- Madia sativa Mol. Coast Tarweed. Annual; occasional/common; road margins, south-facing slopes/grassland, emergent wetland; LP 63.
- Malacothrix californica DC. Annual; occasional/common; mesas, south-facing slopes/dune scrub, coastal scrub; LP 355, 394, 514.
- Microseris linearifolia (DC.) Sch.-Bip. Annual; occasional/occasional to common; mesas/dune scrub, coastal scrub, grassland; LP 263, 304, 349, 356, 421, 461.

Perezia microcephala (DC.) Gray. Sacapellote. Annual; occasional/occasional; mesas, slopes/coastal scrub; LP 75.

Psilocarphus tenellus Nutt. Annual; occasional/common; roadside, mesas/dune scrub, coastal scrub; LP 367.

Rafinesquia californica Nutt. California Plumseed. Annual; uncommon/uncommon; roadside/pine grove; LP 504.

Senecio californicus DC. California Senecio. Annual; occasional/common; mesas, slopes/dune scrub, coastal scrub, chaparral, grassland; LP 208, 234, 275.

Senecio douglasii DC. var. douglasii. Bush Groundsel. Subshrub; occasional/occasional to common; slopes, mesas/dune scrub, coastal scrub; LP 31, 66.

Senecio vulgaris L. Common Groundsel. Annual; occasional/common; lawn/grassland; LP 203; naturalized.

Silybum marianum (L.) Gaertn. Milk Thistle. Annual; occasional/occasional; south-facing slope/forested wetland; LP 473; naturalized.

Solidago confinis Gray. Perennial herb; uncommon/occasional; margin of reservoirs, seeps/emergent wetland; LP 104.

Solidago occidentalis (Nutt.) T. & G. Western Goldenrod. Perennial herb; scattered/scattered to common; margin of reservoirs, seeps/emergent wetland; LP 97.

Sonchus asper (L.) Hill. Prickly Sow-Thistle. Annual; uncommon/common; bottomland/grassland; LP 382; naturalized.

Sonchus oleraceus L. Common Sow-Thistle. Annual; uncommon/uncommon; bottomlands, north-facing slopes/grassland, oak forest; LP 223; naturalized.

Stephanomeria virgata Benth. Twiggy Wreath Plant. Annual; common/occasional to common; mesas, slopes/dune scrub, coastal scrub; LP 23, 72, 86, 98.

Stylocline filaginea (Gray) Gray. Annual; occasional/common; mesas, roadsides/dune scrub, coastal scrub; LP 368.

Stylocline gnaphalioides Nutt. Annual; occasional/common; mesas/dune scrub, coastal scrub; LP 411, 415, 427b.

Taraxacum officinale Wiggers. Common Dandelion. Perennial herb; rare/common; lawn/grassland; LP 249; naturalized.

Tragopogon porrifolius L. Oyster Plant. Annual; uncommon/common; roadside of west-facing slope/forested wetland; LP 470; naturalized.

BORAGINACEAE Borage Family

Amsinckia intermedia F. & M. Fiddleneck. Annual; scattered/occasional to common; Tawn, bottomland/grassland; LP 205, 336.

Amsinckia spectabilis F. & M. var. microcarpa (Greene) Jeps. & Hoov. Annual; occasional/common; mesas, south-facing slopes/dune scrub, coastal scrub; LP 156.

Cryptantha clevelandii Greene var. clevelandii. Cleveland's Cryptantha. Annual; occasional/common; mesas, west-facing slopes/dune scrub, coastal scrub; LP 153, 346, 463, 477, 495.

Cryptantha intermedia (Gray) Greene. Common Cryptantha. Annual; occasional/common; northeast-facing slopes/coastal scrub; LP 466.

Heliotropium curassavicum L. var. oculatum (Heller) Jtn. Salt Heliotrope. Perennial herb; common/occasional; bottomlands, road margins/emergent wetland; LP 3.

Pectocarya penicillata (H. & A.) DC. var. penicillata. Annual; occasional/common; mesas/coastal scrub, chaparral, pine grove; LP 186, 287, 319.

BRASSICACEAE Mustard Family

Athysanus pusillus (Hook.) Greene. Annual; rare/rare; northwest-facing slope/dune scrub; LP 212.

Brassica geniculata (Desf.) J. Ball. Shortpod Mustard. Perennial herb; uncommon/common; bottomland/grassland; LP 383; naturalized.

Brassica rapa L. ssp. sylvestris (L.) Janchen. Field Mustard. Annual; occasional/scattered to common; margins of aqueduct and roads/emergent wetland, grassland; LP 256, 332; naturalized.

Capsella bursa-pastoris (L.) Medic. Shepherd's Purse. Annual; scattered/common; mesas/coastal scrub; LP 177; naturalized.

Cardamine oligosperma Nutt. Western Bitter Cress. Annual; uncommon/common; northwest-facing slope/oak forest; LP 225.

Conringia orientalis (L.) Dumort. Hare's Ear. Annual; rare/rare; bottomland/coastal scrub, scrub-shrub wetland; LP 447; naturalized.

Descurainia pinnata (Walt.) Britton ssp. menziesii (DC.) Detl. Western Tansy Mustard. Annual; scattered/scattered to common; mesas/dune scrub, coastal scrub, grassland; LP 158, 278.

Erysimum suffrutescens (Abrams) G. Rosseb. var. lompocense G. Rosseb. Tufted Wallflower. Perennial herb; common/scattered to common; mesas, slopes/dune scrub, coastal scrub; LP 28, 64, 152, 209, 233, 355, 372, 496.

Lepidium oblongum Small. Annual; uncommon/common; roadbeds/dune scrub; LP 273.

Lepidium virginicum L. var. robinsonii (Thell.) C. L. Hitchc. Annual; scattered/common; mesas, south-facing slopes/coastal scrub, chaparral, grassland; LP 159, 258, 272; naturalized.

Lobularia maritima (L.) Desv. Sweet Alyssum. Perennial herb; uncommon/common; mission grounds; no collection; naturalized.

Raphanus raphanistrum L. Jointed Charlook. Annual; common/abundant; bottomland, cultivated field/grassland; LP 472; naturalized.

Thysanocarpus curvipes Hook. var. curvipes. Lace Pod. Annual; occasional/scattered; mesas, northwest-facing slopes/grassland; LP 185, 211, 311.

CAMPANULACEAE Bellflower Family

Triodanis biflora (R. & P.) McVaugh. Venus Looking-Glass. Annual; rare/rare; bottomlands/emergent wetland; LP 520.

CAPRIFOLIACEAE Honeysuckle Family

Lonicera subspicata H. & A. Shrub; uncommon/occasional; margin of lower reservoir/scrub-shrub wetlands; LP 452.

Sambucus mexicana Presl. Elderberry. Shrub; occasional/occasional; roadside, slopes/coastal scrub, chaparral, oak forest, scrub-shrub wetland; LP 113, 503.

Symphoricarpos mollis Nutt. in T. & G. Snowberry. Shrub; uncommon/uncommon; bottomlands/oak forest.

CARYOPHYLLACEAE Pink Family

Arenaria douglasii Frenzl. ex T. & G. Annual; uncommon/occasional; southwest-facing slope/dune scrub; LP 391.

Cardionema ramosissimum (Weinm.) Nels. & Macbr. Sand Mat. Perennial herb; occasional/common; south-facing slopes, roadbed/dune scrub, coastal scrub, chaparral; LP 134, 428.

Cerastium glomeratum Thuill. Mouse-Ear Chickweed. Annual; uncommon/common; roadside; no collection; naturalized.

Polycarpon depressum Nutt. Annual; occasional/abundant; bottomlands/emergent wetlands; LP 448.

Polycarpon tetraphyllum (L.) L. Four-Leaved All-Seed. Annual; occasional/common; margin of reservoir/emergent wetland; LP 442; naturalized.

Sagina occidentalis Wats. Pearlwort. Annual; occasional/occasional to common; mesas, west-facing slopes, roadbed/grassland, coastal scrub; LP 347, 369a, 431, 486.

Silene antirrhina L. Sleepy Catchfly. Annual; uncommon/common; south-facing slope/coastal scrub; LP 403.

Silene gallica L. Common Catchfly. Annual; occasional/common; mesas, slopes/coastal scrub, grassland; LP 348; naturalized.

Silene laciniata Cav. ssp. major Hitchc. & Maguire. Mexican Pink. Perennial herb; scattered/uncommon; mesas, slopes/chaparral, oak forest; LP 34.

Spergula arvensis L. Corn Spurry. Annual; occasional/common; bottomlands, cultivated field, mesas, southwest-facing slopes/coastal scrub, grassland, emergent wetland; LP 228, 254; naturalized.

Spergularia bocconii (Scheele.) Foucaud. Sandy Spurry. Annual; occasional/common; roadbeds; LP 288, 488a; naturalized.

Spergularia marina (L.) Griseb. Annual; uncommon/occasional; roadbed/emergent wetland; no collection.

Spergularia villosa (Pers.) Camb. Perennial herb; occasional/common; roadbed; LP 366, 488b; naturalized.

Stellaria media (L.) Vill. Common Chickweed. Annual; occasional/abundant; mesas, slopes, lawns/oak woodland, grassland; LP 194; naturalized.

CHENOPODIACEAE Goosefoot Family

Atriplex semibaccata R. Br. Australian Saltbush. Subshrub; uncommon/scattered; roadsides, south-facing slope/grassland; LP 572; naturalized.

Atriplex serenana A. Nels. Annual; occasional/common; road margins/grassland, emergent wetland; LP 1.

Chenopodium californicum (Wats.) Wats. Soap Plant. Perennial herb; scattered/scattered to common; mesas, north-facing slopes/coastal scrub, oak woodland, oak forest, scrub-shrub wetland; LP 165.

Chenopodium multifidum L. Cutleaf Goosefoot. Perennial herb; uncommon/common; lawn/grassland; LP 145; naturalized.

CISTACEAE Rockrose Family

Helianthemum scoparium Nutt. Rock-Rose. Subshrub; occasional/occasional to common; mesas, slopes/coastal scrub, chaparral; LP 87, 246.

CONVOLVULACEAE Morning-Glory Family

Calystegia macrostegia (Greene) Brummitt ssp. cyclostegia (House) Brummitt. Morning-Glory. Perennial herb; scattered/common; mesas, slopes/coastal scrub, chaparral; LP 180.

CRASSULACEAE Stonecrop Family

Crassula erecta (H. & A.) Berger [Tillaea erecta]. Pygmy-Weed. Annual; common/abundant; mesas/dune scrub, coastal scrub, chaparral, grassland; LP 260.

Dudleya lanceolata (Nutt.) Britt. & Rose. Rock Lettuce. Perennial succulent herb; scattered/occasional; slopes/coastal scrub, chaparral; LP 128, 543, 547.

CUCURBITACEAE Gourd Family

Marah fabaceus (Naud.) Greene var. agrestis (Greene) Stocking. California Manroot. Perennial herb; scattered/scattered; mesas/coastal scrub, oak woodland; LP 163, 172.

CUSCUTACEAE Dodder Family

Cuscuta californica H. & A. Dodder. Annual; common/scattered to common, parasitic on several species including Ericameria ericoides, Corethrogyne filaginifolia, Croton californicus; mesas, slopes/dune scrub, coastal scrub; LP 70, 88, 131, 136.

DIPSACACEAE Teasel Family

Dipsacus sativus (L.) Honckeny. Fuller's Teasel. Annual; uncommon/common; roadsides, seeps/grassland, emergent wetland; LP 53; naturalized.

ERICACEAE Heath Family

Arctostaphylos purissima P. V. Wells. Purissima Manzanita. Shrub; common/occasional to common; mesas, slopes/chaparral; LP 79, 90, 188, 327, 328, 361.

Arctostaphylos purissima P. V. Wells X A. rudis Jeps. & Wies. Shrub; rare/rare; northwest-facing slope/chaparral; LP 326.

Arctostaphylos rudis Jeps. & Wies. Shagbark Manzanita. Shrub; common/scattered to common; mesas, slopes/chaparral; LP 83, 89, 121, 178, 324, 325, 330, 362, 502.

EUPHORBIACEAE Spurge Family

Croton californicus Muell.-Arg. var. californicus. Perennial herb or subshrub; common/common; mesas, slopes/dune scrub, coastal scrub, grassland; LP 26, 235.

Eremocarpus setigerus (Hook.) Benth. Turkey Mullein. Annual; uncommon/common; roadbeds; no collection.

Euphorbia lathyris L. Caper Spurge. Annual; scattered/common; margin of aqueduct, seeps/emergent wetland, scrub-shrub wetland; LP 46; naturalized.

Euphorbia peplus L. Petty Spurge. Annual; scattered/common; mesa/coastal scrub, oak woodland; LP 169; naturalized.

FABACEAE Pea Family

Astragalus gambelianus Sheld. Gambell's Dwarf Locoweed. Annual; rare/rare; northeast-facing slope/grassland; LP 339a.

Lotus purshianus (Benth.) Clem. & Clem. Spanish Lotus. Annual; occasional/abundant; roadbed and margins of aqueduct/grassland, emergent wetland; LP 52a; naturalized.

Lotus scoparius (Nutt. in T. & G.) Ottley ssp. scoparius. Deerweed. Shrub; occasional/common; mesas, slopes/coastal scrub, chaparral; LP 484.

Lotus strigosus (Nutt. in T. & G.) Greene var. strigosus. Bishop's Lotus. Annual; occasional/common; mesas, slopes/dune scrub, coastal scrub, grassland; LP 252, 266, 437.

Lupinus albifrons Benth. var. albifrons. Silver Lupine. Shrub; common/common; mesas, slopes/dune scrub, coastal scrub; LP 124, 458.

Lupinus arboreus Sims. Coastal Bush Lupine. Shrub; scattered/scattered to common; bottomlands, mesas, slopes/dune scrub, coastal scrub, grassland; LP 106, 342, 354.

Lupinus bicolor Lindl. ssp. umbellatus (Greene) D. Dunn. Miniature Lupine. Annual; common/common to abundant; mesas, slopes/dune scrub, coastal scrub, grassland; LP 335, 379, 392, 400b.

Lupinus chamissonis Eschs. Dune Lupine. Shrub; common/common; mesas, slopes, field/dune scrub, coastal scrub; LP 27, 120, 244, 259, 457.

Lupinus truncatus Nutt. ex H. & A. Collar Lupine. Annual; occasional/uncommon to occasional; mesas, south-facing slopes/dune scrub, coastal scrub, grassland; LP 251, 267, 299.

Medicago polymorpha L. Bur-Clover. Annual; scattered/common; mesas, lawns/grassland; LP 184; naturalized.

Psoralea orbicularis Lindl. Perennial herb; uncommon/common; margins of aqueduct, seeps/emergent wetland; LP 50.

Trifolium gracilentum T. & G. var. gracilentum. Pinpoint Clover. Annual; rare/rare; northeast-facing slope/grassland; LP 339b.

Trifolium repens L. White Clover. Perennial herb; uncommon/common; mission grounds; no collection; naturalized.

Vicia exigua Nutt. in T. & G. Slender Vetch. Annual; uncommon/occasional; bottomlands/scrub-shrub wetland; LP 476, 542.

Vicia sativa L. Common Vetch. Annual; uncommon/abundant; cultivated field/grassland; LP 522; naturalized.

FAGACEAE Oak Family

Quercus agrifolia Nee. var. agrifolia. Coast Live Oak. Tree; common/scattered to common; mesas, slopes, bottomlands/oak woodland, oak forest, coastal scrub, chaparral; LP 25, 36.

GENTIANACEAE Gentian Family

Centaurium davyi (Jeps.) Abrams. Annual; uncommon/common; south-facing slope/coastal scrub; LP 530, 561.

GERANIACEAE Geranium Family

Erodium botrys (Cav.) Bertol. Broad-Leaved Filaree. Annual; common/common; mesas, slopes, roadsides/grassland; LP 322; naturalized.

Erodium cicutarium (L.) L'Her. Redstem Storksbill. Annual; common/abundant; mesas, slopes/dune scrub, coastal scrub, grassland; LP 160, 264, 321; naturalized.

Erodium moschatum (L.) L'Her. Whitestem Storksbill. Annual; scattered/common; mesas/dune scrub, coastal scrub, emergent wetland; LP 160; naturalized.

Geranium carolinianum L. Carolina Geranium. Annual; uncommon/occasional; margin of aqueduct/emergent wetland; no collection.

HYDROPHYLLACEAE Waterleaf Family

Eucrypta chrysanthemifolia (Benth.) Greene var. chrysanthemifolia. Common Eucrypta. Annual; occasional/common; north-facing slope/oak forest; LP 332.

Phacelia distans Benth. Wild-Heliotrope. Annual; common/scattered to common; mesas, slopes/dune scrub, coastal scrub, grassland; LP 215, 230, 253, 269.

Phacelia douglasii (Benth.) Torr. Annual; occasional/scattered to common; mesas, trails, south-facing slopes/dune scrub, coastal scrub; LP 168, 213, 227.

Phacelia ramosissima Dougl. ex Lehm. var. suffrutescens Parry. Branching Phacelia. Perennial herb; scattered/common; mesas, south-facing slopes/coastal scrub, dune scrub, oak forest, oak woodland; LP 14.

Pholistoma auritum (Lindl.) Lilja. Fiesta Flower. Annual; occasional/common; north and east-facing slopes/oak forest; LP 293, 340, 505.

LAMIACEAE Mint Family

Marrubium vulgare L. Horehound. Perennial herb; occasional/occasional; south-facing slopes, lawn/coastal scrub, grassland; LP 206; naturalized.

Monardella undulata Benth. var. undulata. Annual; occasional/scattered to common; mesas, slopes/dune scrub, coastal scrub, grassland; LP 92, 107, 122, 426a.

Salvia columbariae Benth. var. columbariae. Chia. Annual; common/common; mesas, south-facing slopes/dune scrub, coastal scrub, grassland; LP 300.

Salvia mellifera Greene. Black Sage. Shrub; common/common; south-facing slopes/coastal scrub, chaparral; LP 477.

Salvia spathacea Greene. Pitcher Sage. Perennial herb; occasional/scattered; north-facing slopes/margins of oak forest; LP 297.

Satureja douglasii (Benth.) Briq. Yerba Buena. Perennial herb; occasional/common; bottomlands, west-facing slopes/coastal scrub, scrub-shrub wetland; LP 125, 511.

Stachys bullata Benth. California Hedge Nettle. Perennial herb; occasional/common; north-facing slopes/oak forest; LP 333.

Stachys chamissonis Benth. Chamisso's Hedge Nettle. Perennial herb; rare/common; upper reservoir/forested wetland; LP 11.

LOBELIACEAE Lobelia Family

Nemacladus ramosissimus Nutt. Annual; rare/uncommon; south-facing slope/dune scrub; LP 479, 512.

LYTHRACEAE Loosestrife Family

Lythrum hyssopifolia L. Hyssop Loosestrife. Annual, perennial; uncommon/occasional; roadbed below reservoir/emergent wetland; LP 540.

MALVACEAE Mallow Family

Malva nicaeensis All. Bull Mallow. Annual; uncommon/occasional; roadside; LP 537; naturalized.

Malva parviflora L. Cheeseweed. Annual; uncommon/common; mission grounds; no collection; naturalized.

ONAGRACEAE Evening Primrose Family

Camissonia micrantha (Hornem. ex Spreng.) Raven. Miniature Evening Primrose. Annual; common/common; mesas/dune scrub, coastal scrub; LP 154, 182.

Camissonia strigulosa (Fisch. & Meyer) Raven. Annual; occasional/uncommon to abundant; mesas, south-facing slopes/dune scrub, coastal scrub; LP 222, 265, 301, 376.

Clarkia cylindrica (Jeps.) Lewis & Lewis. Speckled Clarkia. Annual; uncommon/common; bottomlands, slopes/grassland; LP 559.

Clarkia unguiculata Lindl. Elegant Clarkia. Annual; occasional/common; slopes/grassland; LP 505.

Epilobium adenocaulon Hausskn. var. parishii (Trel.) Munz. Perennial herb; occasional/common; streambeds, aqueduct margins/streambed, emergent wetland; LP 38.

Oenothera hookeri T. & G. ssp. hookeri. Hooker's Evening Primrose. Biennial; uncommon/uncommon; streambed, aqueduct/streambed, emergent wetland; LP 132.

OXALIDACEAE Wood-Sorrel Family

Oxalis pes-caprae L. Sour-Grass. Perennial herb; uncommon/common; mission grounds; no collection; naturalized.

PAEONIACEAE Peony Family

Paeonia californica Nutt. ex T. & G. California Peony. Perennial herb; scattered/occasional; mesas, gentle slopes/coastal scrub; LP 170.

PAPAVERACEAE Poppy Family

Dendromecon rigida Benth. ssp. rigida. Bush Poppy. Shrub; occasional/rare to scattered; south-facing slope/coastal scrub, chaparral; LP 151, 239.

Eschscholzia californica Cham. California Poppy. Annual; uncommon/scattered; lawn/grassland; LP 469, 559.

Meconella linearis (Benth.) Nels. & Macbr. var. linearis. Annual; occasional/common; northwest-facing slope, ridge/coastal scrub, grassland; LP 210, 238.

PLANTAGINACEAE Plantain Family

Plantago coronopus L. Annual; uncommon/occasional; roadside; LP 539; naturalized.

Plantago erecta Morris ssp. erecta. Dwarf Plantain. Annual; common/common; mesas, slopes/dune scrub, coastal scrub, grassland; LP 262, 337, 494, 536.

Plantago major L. Common Plantain. Perennial herb; occasional/common; aqueduct/emergent wetland; LP 45; naturalized.

PLATANACEAE Sycamore Family

Platanus racemosa Nutt. Tree; uncommon/scattered; stream banks/forested wetland; LP 588 (planted?).

POLEMONIACEAE Phlox Family

Eriastrum densifolium (Benth.) Mason ssp. elongatum (Benth.) Mason. Giant Wool Star. Annual; occasional/common; mesas, west-facing slopes, road margins/dune scrub, coastal scrub, chaparral; LP 24, 68.

Gilia achilleaefolia Benth. ssp. achilleaefolia. California Gilia. Annual; occasional/occasional to common; south-facing slopes, bottomlands/dune scrub, coastal scrub; LP 218, 387, 517.

Gilia clivorum (Jeps.) V. Grant. Annual; occasional/rare to common; paths, mesas, south-facing slopes/coastal scrub; LP 364, 400a, 513.

Leptodactylon californicum H. & A. ssp. californicum. Prickly Phlox. Subshrub; occasional/scattered to common; western mesa, slopes/coastal scrub, chaparral; LP 174.

Navarretia atractylodes (Benth.) H. & A. Annual; common/abundant; roadsides, mesas/dune scrub, coastal scrub, chaparral; LP 564.

POLYGONACEAE Buckwheat Family

Chorizanthe angustifolia Nutt. Annual; common/scattered to common; mesas, south-facing slopes/dune scrub, coastal scrub; LP 375, 413a, 414b, 482.

Chorizanthe californica (Benth.) Gray. Annual; common/scattered to common; mesas, slopes/dune scrub, coastal scrub; LP 19, 414a, 426b, 460.

Chorizanthe coriacea Goodm. Annual; occasional/common; mesas, south-facing slopes/dune scrub, coastal scrub, chaparral; LP 289, 413b.

Chorizanthe diffusa Benth. var. nivea (Curran) Hoover. Annual; common/abundant; mesas, slopes/chaparral; LP 500, 555.

Eriogonum elongatum Benth. Long-Stemmed Eriogonum. Perennial herb; uncommon/common; roadside/coastal scrub; LP 115.

Eriogonum gracile Benth. Slender Eriogonum. Annual; uncommon/common; mesas/dune scrub, coastal scrub; LP 73.

Eriogonum parvifolium Sm. in Rees. var. parvifolium. Seacliff Buckwheat. Shrub; occasional/common; south-facing slope/coastal scrub; LP 374.

Polygonum amphibium L. var. emersum Michx. Water Smartweed. Perennial; uncommon/common; lower reservoir/emergent wetland; LP 105.

Polygonum aviculare L. Common Knotweed. Annual; uncommon/common; roadside, mission grounds; LP 538; naturalized.

Pterostegia drymarioides F. & M. Fairy Mist. Annual; common/abundant; mesas, slopes/dune scrub, coastal scrub, oak woodland, grassland; LP 459.

Rumex conglomeratus Murr. Green Dock. Perennial herb; uncommon/common; margin of reservoir and aqueduct, bottomlands/emergent wetland; LP 544; naturalized.

Rumex salicifolius Weinm. Willow Dock. Perennial herb; occasional/common; margins of aqueduct, seeps/emergent wetland; LP 39.

PORTULACACEAE Purslane Family

Calandrinia ciliata (R. & P.) DC. var. menziesii (Hook.) Macbr. Red Maids. Annual; occasional/scattered to occasional; northwest-facing slopes/dune scrub; LP 224, 231.

Calyptridium monandrum Nutt. in T. & G. Annual; occasional/common; south-facing slope/coastal scrub; LP 399.

Claytonia perfoliata Donn. var. parviflora (Dougl. ex Hook.) Torr. Small-Flowered Miner's Lettuce. Annual; uncommon/occasional; northwest-facing slope/dune scrub; LP 214.

Claytonia perfoliata Donn. var. perfoliata. Miner's-Lettuce. Annual; occasional/common; mesas, north-facing slopes/oak woodland, oak forest; LP 164.

Portulaca oleracea L. Purslane. Perennial herb; common/occasional; mission grounds; no collection; naturalized.

PRIMULACEAE Primrose Family

Anagallis arvensis L. Scarlet Pimpernel. Annual; common/scattered to abundant; roadsides, mesas/dune scrub, coastal scrub; LP 240, 314; naturalized.

Samolus parviflorus Raf. Water Pimpernel. Perennial herb; uncommon/occasional to common; aqueduct/emergent wetland; LP 42, 100.

RANUNCULACEAE Buttercup Family

Delphinium parryi Gray ssp. blochmanae (Greene) Lewis & Epl. Parry's Delphinium. Perennial herb; uncommon/occasional; slopes/dune scrub, grassland; LP 377, 393, 464.

RHAMNACEAE Buckthorn Family

Ceanothus impressus Trel. var. impressus. Santa Barbara Ceanothus. Shrub; rare/rare; roadside on west mesa, stream bank/chaparral, forested wetland; LP 147, 282; escaped from cultivation on stream bank only.

Ceanothus ramulosus (Greene) McMinn var. fascicularis McMinn. Coast Ceanothus. Shrub; common/scattered to abundant; mesas, slopes/chaparral; LP 82, 176, 181.

Ceanothus spinosus Nutt. in T. & G. Greenbark Ceanothus. Shrub; rare/rare; east-facing slope/coastal scrub; LP 150.

Rhamnus californica Esch. ssp. californica. Coffeeberry. Shrub; common/common; bottomlands, reservoir margins, mesas, slopes/dune scrub, coastal scrub, oak forest, oak woodland, scrub-shrub wetland; LP 13, 498.

Rhamnus crocea Nutt. in T. & G. ssp. crocea. Redberry. Shrub; common/common; slopes/coastal scrub, chaparral, margin of oak forest; LP 20, 80, 179, 343.

ROSACEAE Rose Family

Adenostoma fasciculatum H. & A. Chamise. Shrub; common/scattered to abundant; mesas, slopes/chaparral; LP 81, 499.

Alchemilla occidentalis Nutt. Lady's Mantle. Annual; common/common; mesas, slopes/coastal scrub, grassland, oak forest; LP 296, 338.

Cercocarpus betuloides Nutt. ex T. & G. Mountain Mahogany. Shrub; occasional/occasional to common; mesas, north and west-facing slopes/chaparral; LP 78, 283.

Heteromeles arbutifolia M. Roem. Toyon. Shrub; occasional/occasional to common; mesas, slopes/chaparral, oak woodland, oak forest; LP 33, 77.

Holodiscus discolor (Pursh.) Maxim. var. franciscanus (Rydb.) Jeps. Cream Bush. Scattered/common; stream bank/forested wetland; LP 143; naturalized(?).

Horkelia cuneata Lindl. ssp. puberula (Greene) Keck. Perennial herb; common/common; mesas, south-facing slopes/dune scrub, coastal scrub, grassland; LP 18, 187.

Prunus fasciculata (Torr.) Gray var. punctata Jeps. Sand Almond. Shrub; occasional/scattered to common; south-facing slopes, bottomlands/coastal scrub; LP 110, 397.

Rosa californica Cham. & Schlecht. California Rose. Shrub; scattered/scattered to common; bottomlands/oak forest, scrub-shrub wetland; LP 32, 95, 519.

Rubus ursinus Cham & Schlecht. California Blackberry. Shrub; common/common; seeps, margins of reservoirs and aqueduct, bottomlands/oak forest, scrub-shrub wetland, forested wetland; LP 257.

RUBIACEAE Madder Family

Galium andrewsii Gray ssp. andrewsii. Perennial herb; occasional/common; mesas, slopes/coastal scrub, chaparral, pine grove; LP 69a, 318.

Galium aparine L. Bedstraw. Annual; occasional/occasional to common; north-facing slopes/oak forest; no collection.

Galium nuttallii Gray ssp. nuttallii. Bedstraw. Subshrub; occasional/occasional; mesas, slopes/coastal scrub, oak woodland, forested wetland; LP 69b, 84, 149, 217, 281.

SALICACEAE Willow Family

Populus trichocarpa T. & G. Black Cottonwood. Tree; uncommon/common; stream banks, bottomlands, seeps/forested wetland; LP 112.

Salix laevigata Bebb. var. araquipa (Jeps.) Ball. Tree; scattered/occasional; margins of reservoirs, roads and aqueduct, stream banks/forested wetland; LP 18, 118, 142.

Salix lasiandra Benth. var. lasiandra. Yellow Willow. Tree; uncommon/uncommon; stream bank/forested wetland; LP 141; (planted?)

Salix lasiolepis Benth. var. lasiolepis. Arroyo Willow. Shrub or tree; occasional/common; bottomlands, margins of reservoirs, aqueduct, streambeds/scrub-shrub and forested wetland; LP 49.

SAXIFRAGACEAE Saxifrage Family

Lithophragma affine Gray ssp. affine. Woodland Star. Perennial herb; uncommon/uncommon; north-facing slope/coastal scrub; LP 351.

Lithophragma cymbalaria T. & G. Mission Star. Perennial herb; scattered/occasional; northeast-facing slope/oak forest; LP 199.

Ribes divaricatum Dougl. var. divaricatum. Straggly Gooseberry. Shrub; uncommon/occasional; bottomlands/scrub-shrub wetland. LP 449.

SCROPHULARIACEAE Figwort Family

Antirrhinum kelloggii Greene. Kellogg's Snapdragon. Annual; uncommon/occasional; south-facing slope/coastal scrub; LP 531.

Collinsia bartsiaefolia Benth. in DC. var. bartsiaefolia. Annual; occasional/common; east-facing slope/grassland; LP 331.

Collinsia heterophylla Buist. ex Grah. Chinese Houses. Annual; uncommon/common; northeast-facing slopes/grassland; LP 439.

Cordylanthus littoralis (Ferris) Macbr. Annual; occasional/uncommon to common; south and west-facing slopes, mesas/dune scrub, coastal scrub; LP 22, 71.

Keckiella cordifolia (Benth.) Straw. Climbing Penstemon. Shrub; scattered/common; slopes/chaparral, oak woodland; LP 94.

Linaria canadensis (L.) Dum.-Cours. var. texana (Scheele) Penn. Toadflax. Annual; scattered/occasional to common; mesas/dune scrub, coastal scrub, grassland; LP 274, 350.

Mimulus aurantiacus Curt. ssp. aurantiacus. Shrub; common/common; mesas, slopes/coastal scrub, chaparral; LP 76, 268, 465, 483, 492.

Mimulus aurantiacus Curt. ssp. lompocense (McMinn) Munz. Shrub; occasional/uncommon; mesas, slopes, ridges/coastal scrub, chaparral; LP 491.

Mimulus brevipes Benth. Wide-Throated Monkey Flower. Annual; scattered/scattered to common; mesas, south-facing slopes/dune scrub, coastal scrub; LP 245, 277.

Mimulus floribundus Dougl. ex Lindl. Floriferous Monkey Flower. Annual; uncommon/common; seep on south-facing slope/coastal scrub; LP 535.

Mimulus fremontii (Benth.) Gray. Fremont's Monkey Flower. Annual; uncommon/common; southeast-facing slope/coastal scrub; LP 405, 518.

Mimulus guttatus Fisch. ex DC. Seep-Spring Monkey Flower. Perennial herb; occasional/common; aqueduct/emergent wetland; LP 37, 523.

Mimulus longiflorus (Nutt.) Grant var. longiflorus. Bush Monkey Flower. Shrub; occasional/occasional; roadsides, slopes, ridges/coastal scrub, chaparral; LP 456, 489, 490, 515.

Mimulus longiflorus (Nutt.) Grant var. rutilus Grant. Shrub; rare/rare; roadside on northeast-facing slope/coastal scrub; LP 453; naturalized.

Mimulus longiflorus (Nutt.) Grant var. longiflorus X M. l. var. rutilus Grant. Shrub; rare/rare; roadside on northeast-facing slope/coastal scrub; LP 454, 455.

Orthocarpus purpurascens Benth. var. purpurascens. Owl's Clover. Annual; common/scattered to common; mesas, slopes/coastal scrub, grassland, dune scrub; LP 232, 302, 378, 467.

Orthocarpus purpurascens Benth. var. pallidus Keck. Owl's Clover. Annual; uncommon/occasional; mesas/dune scrub; LP 412.

Pedicularis densiflora Benth. ex Hook. Indian Warrior. Perennial herb; uncommon/common; northeast-facing slopes/chaparral; LP 291.

Penstemon centranthifolius Benth. Scarlet Bugler. Perennial herb; occasional/scattered to common; mesas, slopes/dune scrub, coastal scrub, grassland; LP 91, 123, 310a.

Scrophularia atrata Penn. Black-Flowered Figwort. Perennial herb; uncommon/common; south-facing slope/coastal scrub; LP 534.

Scrophularia californica Cham. & Schlecht. var. californica. California Figwort. Perennial herb; uncommon/common; roadside/oak woodland; LP 508.

SOLANACEAE Nightshade Family

Solanum douglasii Dunal. in DC. Douglas Nightshade. Perennial herb; uncommon/occasional; mesas/grassland, oak woodland; LP 313.

Solanum umbelliferum Eschs. var. umbelliferum. Shrub; scattered/scattered to common; mesas, west-facing slopes/coastal scrub, chaparral; LP 171, 226, 285, 308, 398.

URTICACEAE Nettle Family

Hesperocnide tenella Torr. Annual; occasional/occasional; north-facing slopes/oak forest; LP 345, 507.

Urtica holosericea Nutt. Giant Creek Nettle. Perennial herb; occasional/common; stream bank, margin of aqueduct/emergent wetland; LP 586.

Urtica urens L. Dwarf Nettle. Annual; scattered/scattered; lawn/oak woodland; LP 192; naturalized.

VERBENACEAE Vervain Family

Verbena lasiostachys Link. Western Verbena. Perennial herb; occasional/occasional; margins of reservoirs, bottomlands/oak forest, coastal scrub; LP 8, 109.

SUBCLASS MONOCOTYLEDONES

AMARYLLIDACEAE Amaryllis Family

Dichelostemma pulchella (Salisb.) Heller. Blue Dicks. Perennial herb; scattered/scattered; mesas, south-facing slopes/coastal scrub, grassland; LP 173, 271.

CYPERACEAE Sedge Family

Carex sp. Perennial herb; uncommon/uncommon; margin of aqueduct/emergent wetland; LP 451b.

Carex barbarae Dewey. Perennial herb; occasional/common; margin of reservoirs and aqueduct, seeps, bottomlands/emergent wetland; LP 10, 61a, 127, 385.

Carex globosa Bott. Round-Fruited Sedge. Perennial herb; scattered/scattered; mesas, northeast-facing slope/chaparral; LP 295.

Carex praeegracilis W. Boott. Perennial herb; occasional/common; banks of reservoirs, bottomlands/emergent wetland; LP 9, 61b, 386, 44b, 451a.

Carex senta Boott. Perennial herb; occasional/common; margins of aqueduct/emergent wetland; LP 384.

Eleocharis palustris (L.) R. & S. [E. macrostachya]. Common Spikerush. Perennial herb; uncommon/common; reservoirs/emergent wetland; LP 57.

Scirpus acutus Muhl. Common Tule. Perennial herb; scattered/common; bottomlands, reservoirs/emergent wetland; LP 58.

Scirpus cernuus Vahl. var. californicus (Torr.) Beetle. Annual; occasional/common; margins of aqueduct/emergent wetland; LP 41.

Scirpus microcarpus Presl. Perennial herb; uncommon/common; reservoirs, seeps/emergent wetland; LP 4.

IRIDACEAE Iris Family

Sisyrinchium bellum Wats. Blue-Eyed-Grass. Perennial herb; uncommon/common; bottomlands, southwest-facing slope/grassland; LP 481.

JUNCACEAE Rush Family

Juncus bufonius L. var. bufonius. Toad Rush. Annual; uncommon/common; roadbed, aqueduct/emergent wetland; LP 43.

Juncus effusus L. var. brunneus Engelm. Perennial herb; occasional/common; margins of aqueduct/emergent wetland; LP 40.

Juncus patens E. Mey. Common Rush. Perennial herb; uncommon/uncommon; below reservoir/emergent wetland; LP 545.

Juncus phaeocephalus Engelm. var. phaeocephalus. Perennial herb; occasional/common; below reservoir, margins of aqueduct, seeps/emergent wetland; LP 60, 443, 444.

Juncus tenuis Willd. var. congestus Engelm. Yard Rush. Perennial herb; occasional/uncommon; road margins below reservoirs/emergent wetland; LP 54.

Juncus textilis Buch. Indian Rush. Perennial herb; occasional/common; bottomlands, road margin below reservoirs/emergent wetland; LP 99.

LEMNACEAE Duckweed Family

Lemna minima Phil. Annual; occasional/common; reservoirs and aqueduct/aquatic bed-floating; LP 5.

Wolffiella lingulata (Hegelm.) Hegelm. Annual; uncommon/abundant; reservoirs, aqueduct/aquatic bed-floating; LP 6, 140.

LILIACEAE Lily Family

Asphodelus fistulosus L. Asphodel. Perennial herb; rare/rare; lawn/grassland; LP 195; naturalized.

Zygadenus fremontii Torr. var. fremontii. Star-Lily. Perennial herb; scattered/occasional; mesas/chaparral, oak woodland; LP 316.

ORCHIDACEAE Orchid Family

Habenaria elegans (Lindl.) Boland var. elegans. Elegant Habenaria. Perennial herb; uncommon/uncommon; roadside/chaparral; LP 557.

Habenaria elegans (Lindl.) Boland var. maritima (Greene) Ames. Perennial herb; rare/rare; roadside/chaparral; no collection.

POACEAE Grass Family

Agrostis semiverticillata (Forsk.) C. Chr. Water Bent. Perennial herb; occasional/common; margin of reservoirs and aqueduct, slopes/emergent wetland, oak forest; LP 65, 445; naturalized.

Arundo donax L. Giant Reed. Perennial; uncommon/abundant; roadside below upper reservoir/scrub-shrub wetland; no collection; naturalized.

Avena barbata Brot. Slender Wild Oat. Annual; common/occasional to abundant; lawns, slopes/dune scrub, coastal scrub, grassland; LP 248, 281; naturalized.

Avena sativa L. Cultivated Oat. Annual; scattered/scattered; cultivated field/grassland; LP 241; naturalized.

Bromus carinatus H. & A. var. carinatus. California Brome. Biennial herb; common/occasional to common; lawn, mesas, slopes, margin of cultivated field/grassland, coastal scrub, oak woodland; LP 207, 396.

Bromus diandrus Roth. [Bromus rigidus]. Ripgut Grass. Annual; occasional/common; lawn, slopes/grassland; LP 201, 344; naturalized.

Bromus molliformis Lloyd. Annual; uncommon/common; service area; LP 435; naturalized.

Bromus mollis L. Soft Chess. Annual; common/common to abundant; mesas, slopes, roadsides/dune scrub, grassland; no collection; naturalized.

Bromus rubens L. Foxtail Chess. Annual; common/common; mesas, slopes/dune scrub, coastal scrub, grassland; LP 162, 243; naturalized.

Cynodon dactylon (L.) Pers. Bermuda Grass. Perennial herb; uncommon/common; mission grounds; no collection; naturalized.

Distichlis spicata (L.) Greene var. spicata. Salt Grass. Perennial herb; uncommon/occasional; bottomlands, margin of reservoirs, slopes/coastal scrub, emergent wetland; LP 130.

Ehrharta calycina Smith. Veldt Grass. Perennial herb; uncommon/common; mesa/pine grove; LP 320; naturalized.

Elymus condensatus Presl. Giant Rye. Perennial herb; uncommon/uncommon; north-facing slope/coastal scrub, chaparral; LP 93.

Elymus glaucus Buckl. var. glaucus. Western Rye. Annual; occasional/occasional; margin of seep/oak forest, emergent wetland; LP 111.

Elymus triticoides Buckl. ssp. triticoides.. Alkali Rye. Perennial herb; scattered/occasional; below reservoirs/emergent wetland; LP 56.

Gastridium ventricosum (Gouan) Schinz & Thell. Nit Grass. Annual; uncommon/occasional; mesas, south-facing slope, roadsides/coastal scrub, grassland; LP 533.

Holcus lanatus L. Velvet Grass. Perennial herb; occasional/common; bottomlands, slopes/oak forest; LP 16, 101.

Hordeum californicum Covas. & Steb. Meadow Barley. Perennial herb; occasional/common; roadside, seep/grassland, emergent wetland; LP 474.

Hordeum geniculatum Allioni. Mediterranean Barley. Annual; occasional/common; roadbed below reservoir/emergent wetland; LP 541; naturalized.

Hordeum murinum L. [including H. glaucum & H. leporinum] Annual; uncommon/occasional; bottomlands, lawn/grassland; LP 204; naturalized.

Koeleria macrantha (Ledeb.) Schultes. June Grass. Perennial herb; occasional/scattered; mesas, south-facing slopes/dune scrub, coastal scrub, chaparral; LP 135, 276, 315.

Koeleria phleoides (Vill.) Pers. Annual; common/abundant; roadsides, mesas/dune scrub, coastal scrub, chaparral, grassland; LP 407; naturalized.

Lamarckia aurea (L.) Moench. Goldentop. Annual; scattered/rare to common; mesas, slopes/coastal scrub; LP 183; naturalized.

Melica imperfecta Trin. var. imperfecta. Coast Range Melica. Perennial herb; occasional/occasional to common; mesas, slopes/dune scrub, coastal scrub, chaparral; LP 220, 236.

Muhlenbergia rigens (Benth.) Hitchc. Deer Grass. Perennial herb; uncommon/uncommon; bottomlands/emergent wetland; LP 450.

Phalaris minor Retz. Mediterranean Canary Grass. Annual; uncommon/occasional to abundant; bottomlands, mesas/dune scrub, coastal scrub, emergent wetland; LP 423, 471; naturalized.

Poa annua L. Annual Bluegrass. Annual; scattered/abundant; roadsides, Tawns/grassland, emergent wetland; LP 255, 420; naturalized.

Poa bulbosa L. Bulbous Bluegrass. Perennial herb; uncommon/common; north-facing slope/grassland; LP 438; naturalized.

Polypogon monspeliensis (L.) Desf. Rabbitsfoot Grass. Annual herb; uncommon/common; margins of aqueduct and roadbeds/emergent wetland; LP 44; naturalized.

Schismus barbatus (L.) Thell. Annual; occasional/common to abundant; mesas, slopes, roadsides/dune scrub, coastal scrub, chaparral; LP 157; naturalized.

Stipa cernua Steb. & Love. Nodding Needle Grass. Perennial herb; uncommon/common; mesa, south-facing slope/coastal scrub, chaparral, grassland; LP 532b, 548.

Stipa lepida Hitchc. Small-Flowered Stipa. Perennial herb; occasional/occasional; mesa, south-facing slopes/coastal scrub, grassland; LP 532a.

Vulpia bromoides (L.) Gray [Festuca dertonensis]. Annual; scattered/common; mesas, slopes, lawn/dune scrub, coastal scrub, chaparral, grassland; LP 193a, 298b; naturalized.

Vulpia myuros (L.) K. C. Gmelin var. hirsuta Hack. [Festuca megalura]. Foxtail Fescue. Annual; common/abundant; mesas, slopes/dune scrub, coastal scrub, grassland; LP 193b, 298a, 369b.

Vulpia myuros (L.) K. C. Gmelin var. myuros. [Festuca myuros L.]. Rattail Fescue. Annual; common/common; mesas/grassland; LP 261; naturalized.

Vulpia pacifica Rydb. [Festuca pacifica]. Pacific Fescue. Annual; uncommon/common; northeast-facing slope/grassland; LP 380, 390.

Vulpia octoflora (Walt.) Rydb. [Festuca octoflora]. Six-Weeks Fescue. Annual; common/abundant; mesas, slopes/coastal scrub, grassland; LP 363.

SPARGANIACEAE Bur-Reed Family

Sparganium eurycarpum Engelm. Bur-Reed. Perennial herb; uncommon/abundant; reservoirs/emergent wetland; LP 7.

TYPHACEAE Cattail Family

Typha latifolia L. Soft-Flag. Perennial herb; scattered/common; reservoirs/emergent wetland; LP 59, 102.

ADDENDUM TO THE CATALOGUE

CLASS ANGIOSPERMAE

SUBCLASS DICOTYLEDONES

ASTERACEAE Sunflower Family

Ambrosia psilostachya DC. var. californica (Rydb.) Blake. Western Ragweed. Perennial herb; common/common; slopes, mesas/grassland, dune scrub; LP 580.

Cirsium brevistylum Cronq. Indian Thistle. Biennial; uncommon/occasional; roadsides; LP 579.

Gnaphalium californicum DC. California Cudweed. Green Everlasting. Biennial; occasional/occasional; slopes, mesas/dune scrub, coastal scrub, chaparral; LP 595.

CACTACEAE Cactus Family

Opuntia ficus-indica (L.) Miller. Indian Fig. Succulent shrub; occasional/occasional; south- and west- facing slopes/grassland, coastal scrub; LP 600; naturalized.

CHENOPODIACEAE Goosefoot Family

Beta vulgaris L. Garden Beet, Sugar Beet. Biennial; uncommon/locally common; south-facing slope, seep/emergent; LP 577; naturalized.

Chenopodium berlandieri Moq. var. zschackei (Murr.) Murr. Annual; occasional/uncommon; south-facing slope/grassland, seep; LP 595.

FABACEAE Pea Family

Melilotus indicus (L.) All. Sweet-clover. Annual; uncommon/uncommon; west-facing slope; dune scrub; LP 576; naturalized.

PLANTAGINACEAE Plantain Family

Plantago lanceolata L. Ribgrass. Perennial; uncommon/uncommon; roadside seep; LP 594; naturalized.

POLEMONIACEAE Phlox Family

Eriastrum filifolium (Nutt.) Woot. & Standl. Thread-leaved Eriastrum. Annual; common/occasional; roadsides; LP 567.

POLYGONACEAE Buckwheat Family

Rumex crispus L. Curly Dock. Perennial; occasional/occasional; south-facing slope, seep/emergent wetland; LP 578; naturalized.

SUBCLASS MONOCOTYLEDONES

POACEAE Grass Family

Lolium perenne L. ssp. multiflorum (Lam.) Husnot. Italian Ryegrass.
Annual or biennial; uncommon/common; south-facing slope; grassland; LP
574; naturalized.

Phalaris aquatica L. Harding Grass. Perennial; occasional/occasional;
slopes; grassland; LP 585; naturalized.

APPENDIX IV

ADDITIONAL SPECIES REPORTED BY OTHER INVESTIGATORS

ADDITIONAL SPECIES REPORTED FROM LA PURISIMA MISSION STATE HISTORIC PARK

Reported by C. Smith (1976)

Astragalus curtipes
Carex montereyensis
Chenopodium strictum
Hypericum anagalloides
Spergularia rubra

Reported by V. Human (1982)

Anagallis arvensis caerulea
Arabis glabra
Aster chilensis
Avena fatua
Bloomeria crocea
Brassica nigra
Chenopodium album
C. murale
Chlorogalum pomeridianum
Clarkia purpurea
Clematis ligusticifolia
Convolvulus arvensis
Conyza coulteri
Cordylanthus rigidus
Coreopsis douglasii
Datura meteloides
Dentaria integrifolia
Erigeron foliosus
Foeniculum vulgare
Fragaria, planted?
Grindelia cf robusta
Lamium amplexicaule
Lepidium nitidum
Linaria cf pinifolia
Lotus cf saluginosus
Lupinus nanus
Malacothrix clevelandii

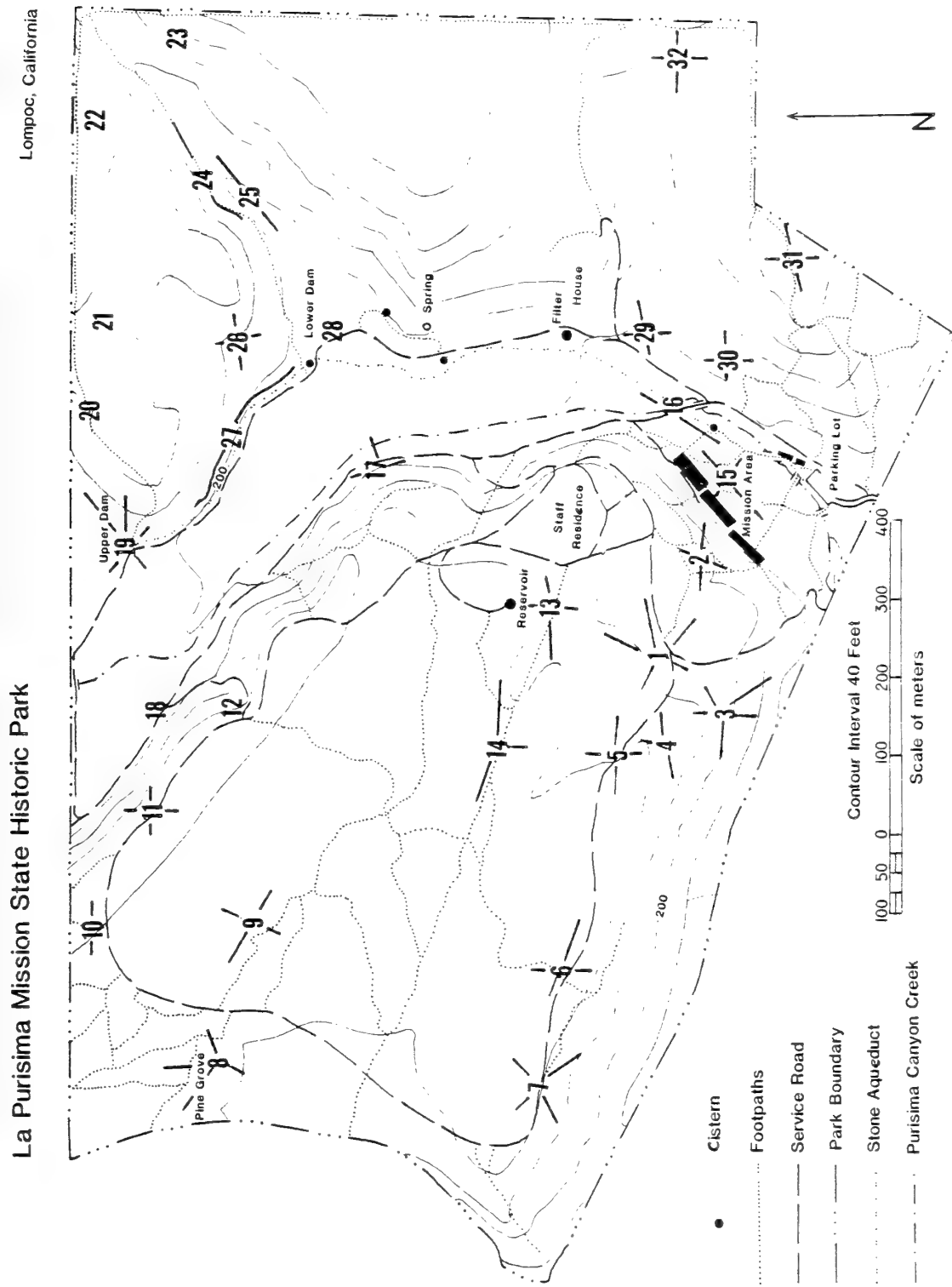
Marah macrocarpus
Matricaria matricarioides
Medicago sativa
Melilotus albus
Microseris cf douglasii
Nicotiana glauca
Orobanche californica
Oxalis corniculata
Phoradendrum tomentosum
P. villosum
Picris echioides
Plagiobothrys nothofulvus
Platystemon californicus
Raphanus sativus
Rumex angiocarpus
Salsola iberica
Sanicula arguta
Sherardia arvensis
Solanum xanti
Stellaria nitens
Stephanomeria exigua
Thelypodium lasiophyllum
Trifolium tridentatum
T. variegatum
Verbascum thapsus
Veronica persica (?)
Xanthium spinosum

APPENDIX V
SPECIES LISTS OF SELECTED LOCALITIES

INTRODUCTION

Species lists for various localities (Fig. 29) throughout the Park have been compiled and usually include sightings from several different dates. Many of these localities have been cited in the text as examples of species associations for the habitats and plant communities identified during this study. Thus, the lists provide a guide to the distribution of the plants of the Park and, in association with the text and vegetation maps (Figs. 7, 10, 15, 26), may assist the user in locating examples of the numerous botanical resources. Intraspecific taxa are not included here but are listed in the Annotated Catalogue. A number on the map corresponds to a numbered list of plants identified by habitat and plant community. Lines associated with numbers on the map indicate approximate area covered by list.

FIG. 29. Localities for species lists.



SPECIES LISTS OF SELECTED LOCALITIES

1. Shallow, sandy basin on Mesa: Northern Coastal Dune Scrub, Central Coastal Scrub and Cismontane Introduced Grasses

<u>Alchemilla occidentalis</u>	<u>G. ramosissimum</u>
<u>Amsinckia spectabilis</u>	<u>Heterotheca echiioides</u>
<u>Apiastrum angustifolium</u>	<u>Horkelia cuneata</u>
<u>Artemisia californica</u>	<u>Hypochoeris glabra</u>
<u>A. dracunculus</u>	<u>Layia glandulosa</u>
<u>Baccharis pilularis</u>	<u>L. glandulosa X L. paniculata</u>
<u>Bowlesia incana</u>	<u>L. paniculata</u>
<u>Bromus diandrus</u>	<u>Lepidium oblongum</u>
<u>B. mollis</u>	<u>L. virginicum</u>
<u>B. rubens</u>	<u>Lessingia germanorum</u>
<u>Camissonia micrantha</u>	<u>Linaria canadensis</u>
<u>C. strigulosa</u>	<u>Lotus strigosus</u>
<u>Caucalis microcarpa</u>	<u>Lupinus albifrons</u>
<u>Centaurea melitensis</u>	<u>L. bicolor</u>
<u>Chenopodium californicum</u>	<u>L. chamissonis</u>
<u>Chorizanthe angustifolia</u>	<u>L. truncatus</u>
<u>C. californica</u>	<u>Marah fabaceus</u>
<u>Cirsium occidentale</u>	<u>Melica imperfecta</u>
<u>Claytonia perfoliata</u>	<u>Microseris linearifolia</u>
<u>Cordylanthus littoralis</u>	<u>Mimulus aurantiacus</u>
<u>Corethrogyne filaginifolia</u>	<u>Navarretia atractyloides</u>
<u>Crassula erecta</u>	<u>Opuntia ficus-indica</u>
<u>Croton californicus</u>	<u>Orthocarpus purpurascens</u>
<u>Cryptantha clevelandii</u>	<u>Penstemon centranthifolius</u>
<u>Cuscuta californica</u>	<u>Perezia microcephala</u>
<u>Daucus pusillus</u>	<u>Phacelia distans</u>
<u>Descurainia pinnata</u>	<u>P. douglasii</u>
<u>Dichelostemma pulchella</u>	<u>P. ramosissima</u>
<u>Eriastrum densifolium</u>	<u>Plantago erecta</u>
<u>Ericameria ericoides</u>	<u>Pterostegia drymarioides</u>
<u>Eriogonum gracile</u>	<u>Rhamnus californica</u>
<u>Eriophyllum confertiflorum</u>	<u>R. crocea</u>
<u>E. multicaule</u>	<u>Salvia columbariae</u>
<u>Erodium cicutarium</u>	<u>Sambucus mexicana</u>
<u>E. moschatum</u>	<u>Schismus barbatus</u>
<u>Erysimum suffrutescens</u>	<u>Senecio douglasii</u>
<u>Euphorbia pepus</u>	<u>Solanum umbelliferum</u>
<u>Filago californica</u>	<u>Stephanomeria virgata</u>
<u>F. gallica</u>	<u>Stylocline filaginea</u>
<u>Galium andrewsii</u>	<u>S. gnaphalioides</u>
<u>G. nuttallii</u>	<u>Toxicodendron diversilobum</u>
<u>Gnaphalium beneolens</u>	<u>Vulpia myuros</u>
<u>G. californicum</u>	

2. Crest of east-facing mesa slope: Central Coastal Scrub, Southern Coastal Oak Woodland and Cismontane Introduced Grasses

Adenostoma fasciculatum
Artemisia californica
Baccharis pilularis
Bromus rubens
Calystegia macrostegia
Ceanothus spinosus
Croton californicus
Cryptantha clevelandii
Daucus pusillus
Encelia californica
Ericameria ericoides
Eriophyllum confertiflorum
Erysimum suffrutescens
Gnaphalium bicolor

Hemizonia increscens
Layia glandulosa
L. glandulosa X L. paniculata
L. paniculata
Melica imperfecta
Penstemon centranthifolius
Pterostegia drymarioides
Quercus agrifolia
Salvia columbariae
Salvia mellifera
Sambucus mexicana
Senecio douglasii
Solanum douglasii
Thysanocarpus curvipes

- 3a. South-facing mesa slope near seep: Central Coastal Scrub, Scrub/Shrub Wetland

Anagallis arvensis
Antirrhinum kelloggii
Artemisia californica
Baccharis pilularis
Centaurium davyi
Encelia californica
Ericameria ericoides
Galium nuttallii
Gastroidium ventricosum
Lotus scoparius
Mimulus aurantiacus
M. floribundus

Paeonia californica
Rhamnus californica
R. crocea
Salix lasiolepis
Salvia mellifera
Scrophularia atrata
Senecio douglasii
S. californica
Stipa cernua
S. lepida
Toxicodendron diversilobum

- 3b. Crest of south-facing open sandy mesa slope: Northern Coastal Dune Scrub

Cordylanthus littoralis
Croton californicus
Ericameria ericoides
Eriophyllum confertiflorum
Erodium cicutarium

E. moschatum
Gastroidium ventricosum
Horkelia cuneata
Navarretia atractyloides
Rhamnus crocea

- 3c. Level portion of south-facing mesa slope: Central Coastal Scrub and
Southern Coastal Oak
Woodland

Artemisia californica
Baccharis pilularis
Cirsium occidentale
Cordylanthus littoralis
Croton californicus
Elymus condensatus
Ericameria ericoides
Eriophyllum confertiflorum

Heterotheca echioides
Leptodactylon californicum
Opuntia sp.
Penstemon centranthifolius
Quercus agrifolia
Salvia mellifera
Senecio douglasii

4. Crest of southwest-facing slope at open, sandy "blowout" area:
Mixed Chaparral, Southern Coastal Oak Woodland and Cismontane
Introduced Grasses

Adenostoma fasciculatum
Arctostaphylos purissima
A. rudis
Bromus rubens
Cardionema ramosissimum
Ceanothus ramulosus
Chorizanthe angustifolia
C. coriacea
Cirsium occidentale
Corethrogyne filaginifolia
Crassula erecta
Croton californicus
Cryptantha clevelandii
Cuscuta californica
Dudleya lanceolata
Ericameria ericoides
Erigeron sanctarum
Eriophyllum confertiflorum
E. multicaule

Helianthemum scoparium
Horkelia cuneata
Koeleria macrantha
Leptodactylon californicum
Lotus scoparius
L. strigosus
Lupinus truncatus
Mimulus aurantiacus
M. brevipes
M. sp. fremontii (annual)
Quercus agrifolia
Rhamnus californica
R. crocea
Salvia mellifera
Schismus barbatus
Senecio californica
S. douglasii
Toxicodendron diversilobum

5. East-facing, gentle mesa slope: Transition between Mixed Chaparral, Central Coastal Scrub and Southern Coastal Oak Woodland

Adenostoma fasciculatum
Anagallis arvensis
Arctostaphylos purissima
A. rudis
Artemisia californica
A. douglasiana
Avena barbata
Baccharis pilularis
Bromus mollis
B. rubens
Calystegia macrostegia
Ceanothus impressus
C. ramulosus
Cercocarpus betuloides
Cordylanthus littoralis
Cryptantha clevelandii
Dichelostemma pulchella
Eriastrum densifolium
Ericameria ericoides
Eriophyllum confertiflorum
Erysimum suffrutescens
Galium andrewsii
G. nuttallii

Gnaphalium ramosissimum
Helianthemum scoparium
Heteromeles arbutifolia
Horkelia cuneata
Koeleria macrantha
K. phleoides
Lessingia germanorum
Lotus scoparius
Lupinus bicolor
L. chamissonis
Mimulus aurantiacus
Navarretia atractylodes
Paeonia californica
Phacelia ramosissima
Pinus sp.
Quercus agrifolia
Rhamnus californica
R. crocea
Salvia mellifera
Sambucus mexicana
Silene laciniata
Toxicodendron diversilobum

6. Mesa top along road: Chamise, Woodland and Mixed Chaparral

Adenostoma fasciculatum
Arctostaphylos purissima
A. rudis
Artemisia californica
Baccharis pilularis
Calystegia macrostegia
Carex globosa
Ceanothus impressus
C. ramulosus
Cercocarpus betuloides
Conyza canadensis
Croton californicus
Cuscuta californica
Dudleya lanceolata
Ericameria ericoides
Helianthemum scoparium

Heterotheca grandiflora
Leptodactylon californicum
Lotus scoparius
Marah fabaceus
Mimulus aurantiacus
Navarretia atractylodes
Paeonia californica
Phacelia ramosissima
Quercus agrifolia
Salvia mellifera
Senecio douglasii
Stephanomeria virgata
Thysanocarpus curvipes
Toxicodendron diversilobum
Zygadenus fremontii

7a. Along path down south-facing mesa slope: Mixed Chaparral

Adenostoma fasciculatum
Arctostaphylos purissima
A. rudis
Artemisia californica
Baccharis pilularis
Ceanothus impressus
C. ramulosus
Corethrogyne filaginifolia

Heterotheca echioides
Horkelia cuneata
Lotus scoparius
Mimulus aurantiacus
Penstemon centranthifolius
Quercus agrifolia
Zygadenus fremontii

7b. Along path down south-facing mesa slope: Chamise Chaparral and open Sand

Adenostoma fasciculatum
Arctostaphylos purissima
A. rudis
Camissonia micrantha
Chorizanthe diffusa
Crassula erecta
Galium andrewsii
Gilia clivorum

Helianthemum scoparium
Horkelia cuneata
Navarretia atractyloides
Psilocarphus tenellus
Salvia mellifera
Schismus barbatus
Spergularia bocconii
Vulpia octoflora

8. Mesa top: Pine grove, oak grove and transitional Woodland Chaparral
Northern Coastal Dune Scrub

Adenostoma fasciculatum
Arctostaphylos rudis
Avena barbata
Baccharis pilularis
Bromus diandrus
Ceanothus ramulosus
Ehrharta calycina
Ericameria ericoides
Eriodinium botrys
E. cicutarium
Erysimum suffrutescens
Galium andrewsii
Gnaphalium californicum
G. ramossissimum

Layia glandulosa
Lupinus bicolor
Orthocarpus purpurascens
Pectocarya penicillata
Pinus attenuata
P. coulteri
P. muricata
P. radiata
P. torreyana
Quercus agrifolia
Q. aff. douglasii
Q. lobata
Thysanocarpus curvipes

9. East of pine grove at disturbed area along trail: Chamise Chaparral,
Central Coastal Scrub,
Oak Woodland/
Woodland Chaparral
and open sand

Adenostoma fasciculatum
Arctostaphylos purissima
A. rudis
Artemisia californica
Baccharis pilularis
Ceanothus ramulosus
Centaurium davyi
Cercocarpus betuloides
Chorizanthe diffusa
Croton californicus
Ericameria ericoides
Eriophyllum confertiflorum
Galium andrewsii
Gnaphalium californicum
Helianthemum scoparium

Heteromeles arbutifolia
Horkelia cuneata
Leptodactylon californicum
Lotus scoparius
Mimulus aurantiacus
M. longiflorus
Penstemon centranthifolius
Pinus torreyana
Quercus agrifolia
Salvia mellifera
Senecio douglasii
Silene laciniata
Stipa cernua
Toxicodendron diversilobum

10. Mesa slope before ridge along road: Mixed Chaparral and Central
Coastal Scrub

Arctostaphylos rudis
Artemisia californica
Camissonia micrantha
C. strigulosa
Chorizanthe angustifolia
Croton californicus
Eriastrum densifolium
Ericameria ericoides
Eriogonum parvifolium
Eriophyllum confertiflorum
Erysimum suffrutescens

Galium andrewsii
Horkelia cuneata
Leptodactylon californicum
Lotus scoparius
Phacelia ramosissima
Pteridium aquilinum
Quercus agrifolia
Rhamnus californica
Salvia columbariae
S. mellifera
Toxicodendron diversilobum

11. Mesa ridge: Pine grove, Mixed Chaparral and Woodland Chaparral

Adenostoma fasciculatum
Arctostaphylos rudis
Artemisia californica
Ceanothus ramulosus
Cercocarpus betuloides
Dudleya lanceolata
Erysimum suffrutescens
Leptodactylon californicum
Lotus scoparius

Lupinus truncatus
Mimulus aurantiacus
Penstemon centranthifolius
Pinus muricata
P. torreyana
Quercus agrifolia
Salvia mellifera
Toxicodendron diversilobum

12. Vicinity of road cut on mesa ridge: Arctostaphylos Chaparral,
Woodland Chaparral and pine
grove

Adenostoma fasciculatum
Arctostaphylos purissima
A. purissima X A. rudis
A. rudis
Carex globosa

Habenaria elegans
Pedicularis densiflora
Pinus muricata
Quercus agrifolia
Sanicula laciniata

13. Vicinity of trail on mesa slope and top: Transitional area of
Woodland Chaparral,
Central Coastal Scrub and
Northern Coastal Dune Scrub

Arctostaphylos rudis
Artemisia californica
Avena barbata
Bromus rubens
Camissonia strigulosa
Ceanothus ramulosus
Chorizanthe spp.
Cordylanthus littoralis
Cryptantha clevelandii
Ericameria ericoides
Eriophyllum confertiflorum
Helianthemum scoparium
Layia glandulosa
Leptodactylon californicum
Lupinus albifrons

L. bicolor
L. chamissonis
L. truncatus
Lotus scoparius
Monardella undulata
Penstemon centranthifolius
Pinus torryana
Plantago erecta
Pteridium aquilinum
Pterostegia drymarioides
Quercus agrifolia
Salvia mellifera
Toxicodendron diversilobum
Vulpia myuros

14. Vicinity of trail on mesa top: Woodland Chaparral and open sand

<u>Adenostoma fasciculatum</u>	<u>Galium andrewsii</u>
<u>Arctostaphylos rudis</u>	<u>G. nuttallii</u>
<u>Artemisia californica</u>	<u>Gnaphalium californicum</u>
<u>Bromus rubens</u>	<u>G. microcephalum</u>
<u>Camissonia micrantha</u>	<u>G. ramosissimum</u>
<u>Calandrinia ciliata</u>	<u>Horkelia cuneata</u>
<u>Cardionema ramosissima</u>	<u>Leptodactylon californicum</u>
<u>Carex globosa</u>	<u>Lotus scoparius</u>
<u>Ceanothus ramulosus</u>	<u>Microseris linearifolia</u>
<u>Chorizanthe spp.</u>	<u>Mimulus aurantiacus</u>
<u>Croton californicus</u>	<u>Navarretia atractylloides</u>
<u>Cryptantha clevelandii</u>	<u>Quercus agrifolia</u>
<u>Daucus pusillus</u>	<u>Rhamnus californica</u>
<u>Dichelostemma pulchella</u>	<u>Salvia mellifera</u>
<u>Dudleya lanceolata</u>	<u>Schismus barbatus</u>
<u>Eriastrum densifolium</u>	<u>Senecio douglasii</u>
<u>Ericameria ericoides</u>	<u>Sagina occidentalis</u>
<u>Eriophyllum confertiflorum</u>	<u>Solanum umbelliferum</u>
<u>Erodium botrys</u>	<u>Stylocline gnaphalioides</u>
<u>E. cicutarium</u>	<u>Toxicodendron diversilobum</u>
<u>Filago californica</u>	<u>Vulpia octoflora</u>
<u>F. gallica</u>	

15. Mission grounds: naturalized and native species of disturbed substrates

<u>Anagallis arvensis</u>	<u>Gnaphalium luteo-album</u>
<u>Brassica geniculata</u>	<u>Heterotheca grandiflora</u>
<u>B. nigra</u>	<u>Hordeum murinum</u>
<u>Bromus diandrus</u>	<u>Hypochoeris glabra</u>
<u>B. carinatus</u>	<u>Lobularia maritima</u>
<u>Capsella bursa-pastoris</u>	<u>Malva parviflora</u>
<u>Chenopodium multifidum</u>	<u>Marrubium vulgare</u>
<u>C. murale</u>	<u>Oxalis pes-caprae</u>
<u>Conyza bonariensis</u>	<u>Poa annua</u>
<u>C. canadensis</u>	<u>Polygonum aviculare</u>
<u>Croton californicus</u>	<u>Portulaca oleracea</u>
<u>Cynodon dactylon</u>	<u>Schismus barbatus</u>
<u>Erodium cicutarium</u>	<u>Sonchus oleraceus</u>
<u>Eschscholzia californica</u>	<u>Taraxacum officinale</u>
<u>Euphorbia peplis</u>	<u>Trifolium repens</u>

16. Los Berros Creek: Riverine and Palustrine Wetlands and associated upland vegetation

Artemisia californica
A. douglasiana
Baccharis pilularis
Ceanothus ramulosus
Conium maculatum
Cercocarpus betuloides
Epilobium adenocaulon
Holodiscus discolor
Juglans californica
Juncus patens
Marrubium vulgare
Oenothera hookeri

Platanus racemosa
Rhamnus californica
Ribes amarum
R. aureum
Salix laevigata
S. lasiandra
S. lasiolepis
Sambucus mexicana
Scirpus microcarpus
Toxicodendron diversilobum
Urtica holosericea

17a. Los Berros Creek: Palustrine Wetland

Artemisia douglasiana
Baccharis pilularis
Rubus ursinus

Salix laevigata
S. lasiolepis

17b. Northeast-facing slope: Cismontane Introduced Grasses, dominated by numerous native species

Amsinckia spectabilis
A. intermedia
Brassica rapa
Bromus diandrus
Camissonia micrantha
Cerastium glomeratum
Clarkia unguiculata
Claytonia perfoliata
Collinsia bartsiaefolia
Croton californicus
Cryptantha intermedia
Delphinium parryi
Eriastrum densifolium
Erysimum suffrutescens
Heterotheca echioides

H. grandiflora
Layia glandulosa
Lessingia germanorum
Linaria canadensis
Lupinus bicolor
L. truncatus
Meconella linearis
Medicago polymorpha
Orthocarpus purpurascens
Phacelia distans
P. douglasii
Pterostegia drymarioides
Stachys bullata
Thysanocarpus curvipes
Vulpia myuros

17c. Moist shaded base of northeast-facing slope: Central Coastal Scrub

Alchemilla occidentalis
Astragalus gambelianus
Baccharis pilularis
Crassula erecta
Hypochoeris glabra

Meconella linearis
Plantago erecta
Rhamnus californica
Trifolium gracilentum
Vulpia pacifica

18a. Base of north-facing slope: Coast Live Oak Forest and Central Coastal Scrub

Alchemilla occidentalis
Amsinckia spectabilis
Artemisia californica
Baccharis pilularis
Cercocarpus betuloides
Chenopodium californicum
Claytonia perfoliata
Crassula erecta
Elymus condensatus
Ericameria ericoides
Eriophyllum confertiflorum

Erysimum suffrutescens
Gnaphalium californicum
Horkelia cuneata
Keckiella cordifolia
Marah fabaceus
Pteridium aquilinum
Quercus agrifolia
Rhamnus californica
R. crocea
Sambucus mexicana
Toxicodendron diversilobum

18b. Base of northeast-facing slope: Central Coastal Scrub

Artemisia californica
Baccharis pilularis
Elymus condensatus
Ericameria ericoides
Heteromeles arbutifolia
Keckiella cordifolia
Marrubium vulgare
Monardella undulata

Pteridium aquilinum
Rhamnus californica
R. crocea
Sambucus mexicana
Senecio douglasii
Stephanomeria virgata
Toxicodendron diversilobum

19. Vicinity of Upper Reservoir: Palustrine Wetlands, Coast Live Oak Forest, and grasslands

Agrostis semiverticillata
Artemisia douglasiana
Arundo donax
Baccharis douglasii
Bromus carinatus
Cardamine oligosperma
Carex barbarae
C. praegracilis
C. senta
Cordylanthus littoralis
Distichlis spicata
Eremocarpus setigera
Gnaphalium luteo-album
Hemizonia increscens
Holcus lanatus
Juncus bufonius
J. effusus
Layia glandulosa
L. paniculata
Lemna minima
Lotus purshianus
Oenanthë sarmentosa
Phacelia ramosissima

Poa annua
Psoralea orbicularis
Quercus agrifolia
Rhamnus californica
R. crocea
Rosa californica
Rubus ursinus
Salix laevigata
S. lasiolepis
Scirpus acutus
S. microcarpus
Sparganium eurycarpum
Spergularia bocconii
Solidago confinus
S. occidentalis
Sonchus oleraceus
Stachys chamissonis
Toxicodendron diversilobum
Typha latifolia
Verbena lasiostachys
Vulpia myuros
Wolffiella lingulata
Woodwardia fimbriata

20. Northwest-facing slope of foothills: Central Coastal Scrub, Mixed Chaparral and Cismontane
Introduced Grasses

Adenostoma fasciculatum
Ambrosia psilostachya
Arctostaphylos rudis
Artemisia californica
A. douglasiana
A. dracunculus
Bromus diandrus
Chenopodium californicum
Ceanothus ramulosus
Cercocarpus betuloides
Chorizanthe spp.
Collinsia bartsiaefolia
Cordylanthus littoralis
Corethrogyne filaginifolia
Croton californicus
Cuscuta californica
Dudleya lanceolata
Ericameria ericoides
Eriophyllum confertiflorum
E. multicaule
Erysimum suffrutescens
Galium nuttallii
Gilia achilleaefolia
Gnaphalium bicolor
Hemizonia increscens
Heterotheca echioides (?)

Horkelia cuneata
Koeleria macrantha
Layia glandulosa
Lessingia germanorum
Leptodactylon californicum
Lotus scoparius
Lupinus albifrons
L. chamissonis
Melica imperfecta
Orthocarpus purpurascens
Penstemon centranthifolius
Phacelia ramosissima
Prunus fasciculata
Pteridium aquilinum
Quercus agrifolia
Rhamnus californica
R. crocea
Ribes amarum
Salvia columbariae
S. mellifera
Sambucus mexicana
Solanum umbelliferum
Stephanomeria virgata
Symphoricarpos mollis
Toxicodendron diversilobum
Vulpia pacifica

21. Flat on crest of divide: Central Coastal Scrub and Cismontane
Introduced Grasses

Avena barbata
Bromus diandrus
Chaenactis glabriuscula
Cnicus benedictus
Croton californicus
Ericameria ericoides
Eriophyllum multicaule
Erodium botrys
E. moschatum
Heterotheca grandiflora
Hypochoeris glabra

Lasthenia californica (see # 387)
Layia glandulosa
Lupinus bicolor
L. chamissonis
Malacothrix californica
Orthocarpus purpurascens
Phacelia douglasii
Plantago erecta
Prunus fasciculata
Senecio californica

22. South-facing sandy slope: Northern Coastal Dune Scrub in area dominated by Central Coastal Scrub and Cismontane Introduced Grasses

Ericameria ericoides
Eriophyllum confertiflorum
Gnaphalium bicolor
Heterotheca echioides
Horkelia cuneata
Layia glandulosa

Lotus scoparius
Lupinus chamissonis
L. truncatus
Melica imperfecta
Orthocarpus purpurascens
Pteridium aquilinum

23. Northwest-facing slope of foothills: Woodland Chaparral and Central Coastal Scrub

Arctostaphylos purissima
A. rudis
Artemisia californica
Carex globosa
Ceanothus ramulosus
Corethrogyne filaginifolia
Croton californicus
Dendromecon rigida
Helianthemum scoparium
Heteromeles arbutifolia

Heterotheca echioides?
Horkelia cuneata
Leptodactylon californicum
Lupinus chamissonis
Orthocarpus purpurascens
Phacelia ramosissima
Pteridium aquilinum
Quercus agrifolia
Senecio douglasii

24. Sandy soil of path at base of southeast-facing slope: grassland

Bromus rubens
Chorizanthe spp.
Croton californicus
Eriastrum densifolium
Erodium cicutarium
Erysimum suffrutescens
Filago californica

Layia glandulosa
Linaria canadensis
Melica imperfecta
Phacelia distans
P. douglasii
Salvia columbariae

25. Ravine bottomland: Palustrine Wetlands and Central Coastal Scrub

Artemisia douglasiana
A. dracunculus
Baccharis pilularis
Carex barbarae
C. praegracilis
Cordylanthus littoralis
Distichlis spicata
Euphorbia lathyris
Juncus textilis
Layia paniculata
Lonicera subspicata
Muhlenbergia rigens

Phacelia ramosissima
Quercus agrifolia
Rhamnus californica
R. crocea
Rosa californica
Rubus ursinus
Salix lasiolepis
Satureja douglasii
Scirpus californicus
Toxicodendron diversilobum
Urtica holosericea

26. South-facing slope of foothill divide: Northern Coastal Dune Scrub
and Central Coastal Scrub

Artemisia californica
A. dracunculus
Chaenactis glabriuscula
Corethrogyne filaginifolia
Croton californicus
Ericameria ericoides
Eriophyllum confertiflorum
E. multicaule
Erysimum suffrutescens
Euphorbia lathyris
Filago californica
F. gallica
Gnaphalium ramosissimum
Heterotheca echioides
Horkelia cuneata

Hypochoeris glabra
Layia glandulosa
L. paniculata
Lupinus albifrons
L. chamissonis
Malacothrix californica
Melica imperfecta
Nemacladus ramosissimus
Orthocarpus purpurascens
Prunus fasciculata
Rhamnus californica
R. crocea
Salvia columbariae
S. mellifera
Vulpia myuros

27. Seep along aqueduct and road: Palustrine Wetlands

Artemisia douglasiana
Azolla filiculoides
Baccharis douglasii
B. pilularis
Carex barbarae
C. sp.
Epilobium adenocaulon
Euphorbia lathyris
Gnaphalium luteo-album
Juncus bufonius
J. effusus
J. phaeocephalus
J. textilis
Lemna minima
Lolium perenne
Mimulus guttatus
Oenothera hookeri

Oenanthe sarmentosa
Plantago major
Polypogon monspeliensis
Psoralea orbicularis
Pteridium aquilinum
Rhamnus californica
Rosa californica
Rubus ursinus
Rumex crispus
R. salicifolius
Salix lasiolepis
Samolus parviflorus
Scirpus cernuus
S. microcarpus
Solidago confinis
S. occidentalis
Toxicodendron diversilobum

28. Vicinity of Lower Reservoir: Palustrine Wetlands

<u>Agrostis semiverticillata</u>	<u>J. tenuis</u>
<u>Anagallis arvensis</u>	<u>Lolium perenne</u>
<u>Anthemis cotula</u>	<u>Lythrum hyssopifolia</u>
<u>Avena barbata</u>	<u>Phalaris minor</u>
<u>Azolla filiculoides</u>	<u>Picris echioides</u>
<u>Baccharis pilularis</u>	<u>Polypogon monspeliensis</u>
<u>Brassica nigra</u>	<u>Polygonum amphibium</u>
<u>Bromus mollis</u>	<u>Rhamnus californica</u>
<u>Carex barbarae</u>	<u>Rumex conglomeratus</u>
<u>C. praegracilis</u>	<u>R. crispata</u>
<u>Dipsacus sativus</u>	<u>R. salicifolius</u>
<u>Eleocharis palustris</u>	<u>Scirpus acutus</u>
<u>Elymus triticoides</u>	<u>Sonchus asper</u>
<u>Gnaphalium luteo-album</u>	<u>S. oleraceus</u>
<u>Hordeum californicum</u>	<u>Sparganium eurycarpum</u>
<u>H. geniculatum</u>	<u>Toxicodendron diversilobum</u>
<u>Juncus bufonius</u>	<u>Typha latifolia</u>
<u>J. effusus</u>	<u>Urtica holosericea</u>
<u>J. patens</u>	<u>Verbena lasiostachys</u>
<u>J. phaeocephalus</u>	

29a. Mouth of ravine in previously disturbed area: Transitional Northern Coastal Dune Scrub and Cismontane Introduced Grasses

<u>Amsinckia intermedia</u>	<u>Heterotheca grandiflora</u>
<u>Baccharis pilularis</u>	<u>Lupinus arboreus</u>
<u>Bromus diandrus</u>	<u>Marrubium vulgare</u>
<u>Ericameria ericoides</u>	

29b. Mouth of ravine: Scrub/Shrub Wetland

<u>Artemisia douglasiana</u>	<u>Satureja douglasii</u>
<u>Baccharis pilularis</u>	<u>Verbena lasiostachys</u>
<u>Chenopodium californicum</u>	

30. West-facing slope: Transitional Northern Coastal Dune Scrub and Central Coastal Scrub adjacent to Coast Live Oak Forest

Alchemilla occidentalis
Apiastrum angustifolium
Artemisia californica
Avena barbata
Baccharis pilularis
Bromus rubens
Cerastium glomeratum
Corethrogyne filaginifolia
Cryptantha clevelandii
Ericameria ericoides
Eriophyllum confertiflorum

Erodium cicutarium
Erysimum suffrutescens
Filago californica
Galium andrewsii
Lupinus arboreus
Melica imperfecta
Pteridium aquilinum
Rhamnus californica
R. crocea
Vulpia myuros

31. Crest of foothill ridge: Mixed Chaparral, Central Coastal Scrub and Cismontane Introduced Grasses

Arctostaphylos rudis
Artemisia californica
Avena barbata
Bromus diandrus
B. mollis
B. rubens
Ceanothus ramulosus
Cercocarpus betuloides
Corethrogyne filaginifolia
Daucus pusillus
Ericameria ericoides
Erodium cicutarium
Gnaphalium californicum

G. chilense
Helianthemum scoparium
Heteromeles arbutifolia
Leptodactylon californicum
Lotus scoparius
Lupinus truncatus
Mimulus aurantiacus
Orthocarpus purpurascens
Plantago erecta
Salvia mellifera
Thysanocarpus curvipes
Toxicodendron diversilobum

32. Bottomland at head of ravine: Transitional area of Northern Coastal Dune Scrub, Central Coastal Scrub and Woodland Chaparral

Artemisia californica
A. dracunculus
Bromus rubens
Chaenactis glabriuscula
Corethrogyne filaginifolia
Cryptantha clevelandii
Dichelostema pulchella
Ericameria ericoides

Eriophyllum multicaule
Layia glandulosa
Lotus scoparius
Lupinus chamissonis
Phacelia distans
P. douglasii
Prunus fasciculata
Quercus agrifolia

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